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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW

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THE MANUFACTURE OF COPPER DRIVING BANDS

AN INTERESTING STORY OF HOW WAR-TIME NEEDS DEVELOPED THE ONE BEST WAY FOR THE PRODUCTION OF PURE COPPER CASTINGS IN LARGE QUANTITIES.

WRITTEN FOR THE METAL INDUSTRY BY WM. J. REARDON, SUPERINTENDENT OF FOUNDRIES, ROME MANUFACTURING COMPANY, ROME, N. Y.

With the event of the great world war breaking out during 1914, it was necessary to place large orders in this country for shells of all sizes and, as a consequence, similar demand was made for copper driving bands for shells produced here and on the other side.

The demand for copper driving bands found the trade utterly unprepared to cope with the proposition, as what few driving bands that were made in this country were produced from seamless tubing and the recognized authority on copper had specified that only Lake copper could be used to make driving bands successfully.

However, after considerable discussion and thought on the part of the manufacturers and Munitions Board members, various new methods were tried out —some of which proved absolute failures, owing to being unsuitable for any type of shell and, some of which proved successful for one type and the opposite for another type of shell.

Some of the older methods of making bands from tube gave excellent results, such as taking a solid billet of copper, boring a hole in the center, removing the skin off the outside, then rolling out on suitable machines and finishing off on the bench. Persistent experimenting at this time, however, was beginning to eliminate the various objections and bringing to light new methods and ideas consistent with the specifications asked for. Many firms, however, started out to manufacture bands on a large scale by a process that looked good in the experimental stage; only to find that the method developed some defect or they had overlooked what seemed to be a small defect, and the result was that they had to go out of business entirely, thoroughly disgusted with anything that

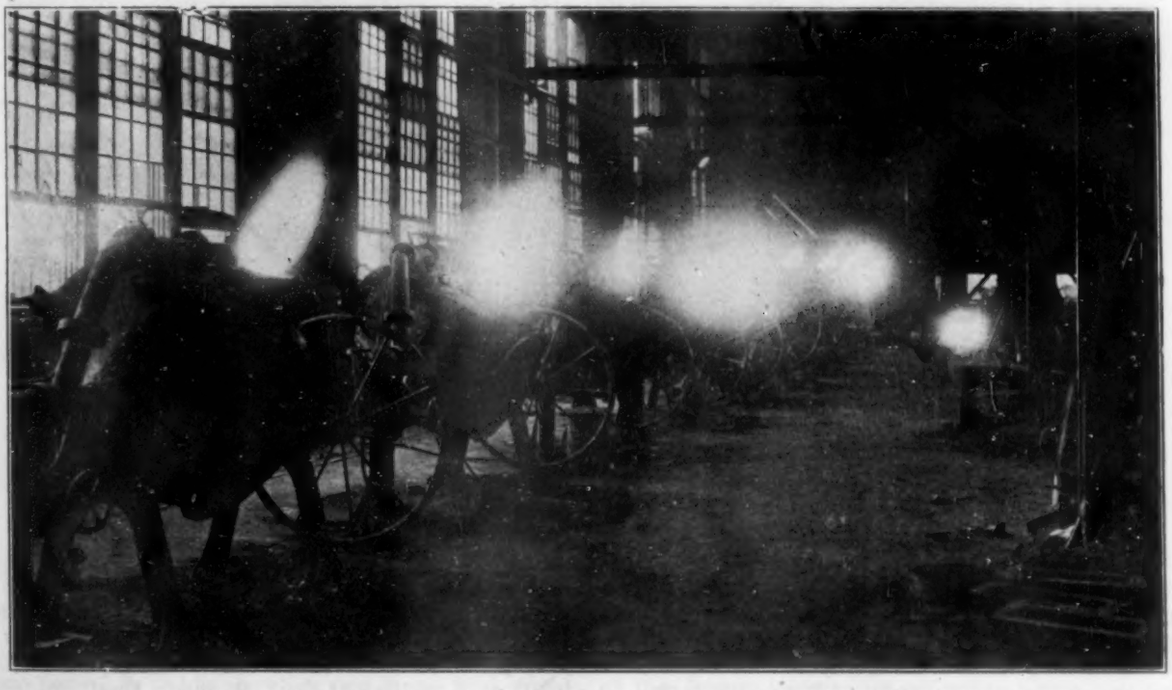

FIG. 1.—BATTERY OF SCHWARTZ METAL MELTING FURNACES USED FOR MELTING PURE COPPER AT THE PLANT OF THE ROME MANUFACTURING COMPANY, ROME, N. Y.

bore any possible resemblance to a copper band.

During 1915, the Rome Manufacturing Company of Rome, N. Y., was requested by the Imperial Munitions Board of Canada to look into the possibility and proposition of furnishing copper rotating bands. At this time the production of steel shells was away ahead of the production of the necessary bands and matters in general were somewhat in an incompleted state, due to the unsuccessful attempts to procure satisfactory bands.

After extensive experiments at a very large expenditure of money, this company succeeded in producing as high as 100,000 bands per day by the sheet and cupping method of all sizes of bands up to six inch. bands weighing from six to sixty-five pounds each, by the Ward process of rolling from a cast band.

The proposition of melting and casting 150,000 pounds of copper per day appealed to me at that time as an easy proposition. I had figured that if I could cast successfully 1,000 pounds per day, why not 150,000 pounds. However, I had not taken into consideration about 1,000 little IF'S that were afterward encountered and finally overcome with sincere satisfaction to "yours truly."

To begin the proposition, we had a large building, formerly used as a boiler shop, in connection with a locomotive repair shop. We decided on installing eighteen Hawley down draft Schwartz open flame

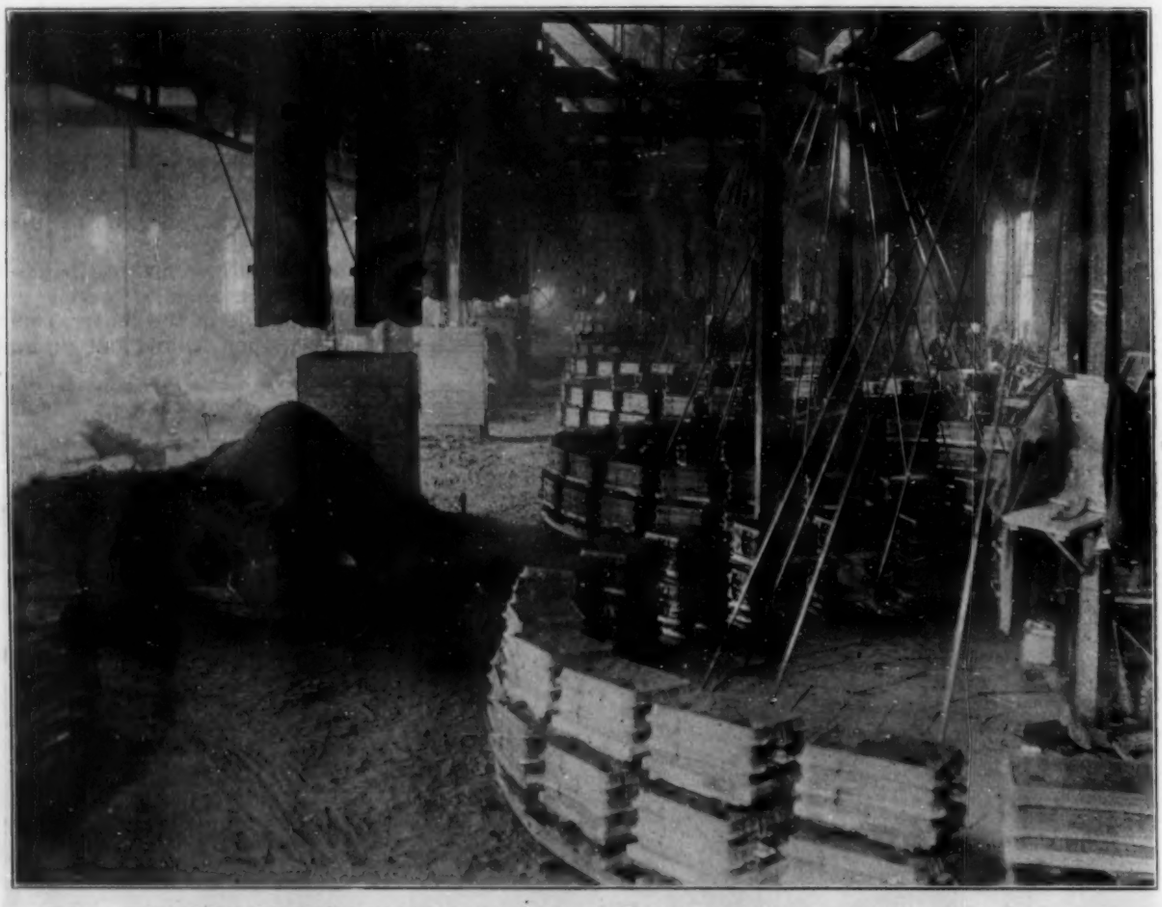

FIG. 2.—THE MERRY-GO-ROUNDS IN THE FOUNDRY OF THE ROME MANUFACTURING COMPANY, ROME, N. Y.

The successful operation of this proposition is surely worthy of consideration and due regard to the efficient method under which the officials of the company persisted in their efforts for complete satisfaction in regard to quality and quantity of bands produced.

The sheet and cupping method produced approximately sixty-six per cent scrap and a new proposition now presented itself. To take care of 100,000 pounds of copper scrap each day was no little problem as the conversion charge and freight to and from the smelter was too high for consideration; also the fact that the smelters were rapidly getting to maximum production on war work, made the situation more complicated and the ever increasing scrap copper pile was beginning to force an early issue as to the success of the whole proposition.

At this stage of the game, I was offered the proposition of utilizing this scrap copper for producing melting furnaces of the forty-two and sixty inch sizes. This installation gave us a melting capacity of 157,500 pounds per day of ten hours produced as follows: Nine forty-two inch furnaces produced five heats each per day at the rate of one thousand pounds per heat and the nine sixty inch furnaces, five heats per day with an output of twenty-five hundred pounds per heat. To keep these furnaces properly lined so as to be of the most efficient use, was no small problem, with the original lining material such as gannister and German fire clay unobtainable. However, thanks to the fact of necessity, we were successful after exhaustive experiments in producing a furnace lining of material obtainable in large quantities in this country and one which we found to be far superior to the lining we had previously known as the best.

Our first impression that we would have clear sailing, vanished soon after the start. The proposition

was so big that what we thought would take three months, really was a year in the making, and to appreciate what had to be done, the following is a brief outline of the necessary work and equipment.

EQUIPMENT.

Eighteen Schwartz furnaces that had to be purchased and installed with the necessary equipment of oil heating and pumping system; blowers and necessary piping, etc; fifty molding machines of various makes suitable to the production requirements; a net work of overhead trolleys for deliverying and pouring metal—as no metal was carried; a complete equipment of cleaning machinery consisting of three separate sand blast units, cutting off saws and grinding machines, in addition to seven large lead lined tanks; 2000 sterling steel flasks; six separate and complete sand mixing and handling units and the manufacture and installation of eleven merry-go-rounds to handle the molds from the molders; the making and installing on molding machines of sixty metal patterns, and last but not the least of our troubles was to teach three hundred men a game they had never played. This, in itself, would make a long and interesting story, but bringing that battle to light again is rather out of place at this time and worthy of only passing mentioning as we were only one in a great many thousand who had to lead the same gang.

In addition to our foundry, we had to equip and install a machine shop consisting of thirty floor lathes, ten Ward rolling machines, necessary sizing presses and a large annealing unit capable of handling and completing approximately five thousand bands per day, weighing from six to sixty-five pounds each.

OBSTACLES OVERCOME.

The rigid requirements and tests added somewhat to our troubles at the start, only to be increased as the work progressed. These were overcome, however, as we went along and finally no test however rigid, had any terrors for us as we were beginning to move along with the one idea in mind, that a band, to pass inspection must be 100% perfect and as an illustration of the high pitch of thought in the minds of the foreman, one man suggested that we put fly screens on all the windows and doors as a Safety First measure.

FIG. 3.—WARD ROLLING MACHINES FOR ROLLING OUT COPPER DRIVING BANDS AT THE PLANT OF THE ROME MANUFACTURING COMPANY, ROME, N. Y.

There are, however, obstacles to overcome in any new line of business and one which we found the hardest to overcome was the prejudice against a cast band by most of the authorities on copper. They claimed that copper could not be cast in a pure state. The fact, however, that millions of pounds of cast copper rings had been manufactured by the Rome Manufacturing Company and had passed all the visual, physical and chemical tests, is conclusive evidence against any argument or prejudice against the efficiency and quality of the cast copper band.

For the benefit of those who are not familiar with the test required, the following will enlighten. From every thousand bands, two samples were selected by the inspectors. These samples were bent flat and when bent should not show any signs of cracking at the bend. Test pieces were then taken and they must test 30,000 pounds tensile strength and 25% elongation in two inches and had to analyze 99.75 percent. pure copper. Another test was to select a band from each thousand and take a cut clean across the face of the band and then make a visual inspection for any sign of a flaw the size of a pin end, and, should one be found, the thousand bands were rejected, divided into lots of one hundred each and the same procedure gone through for each lot. The latter test was to insure a perfect band that would not develop defects when machining the band after it had been pressed on the shell.

FIG. 4.—FACING AND EDGEING LATHES USED ON COPPER DRIVING BANDS AT THE PLANT OF THE ROME MANUFACTURING COMPANY, ROME, N. Y.

Bands manufactured by the Ward process, as shown in sketch Fig. 5, and photos of actual operation we contend are inferior to none and further, due to the method of manufacture described in the following paragraph, they are more efficient than bands manufactured by the forging, drawn or tube, stamped and extruded method.

The rolling of cast copper bands by the Ward process is to some extent a similar method as is used for rolling steel tires for car and wagon wheels. Almost everybody is familiar with the rigid use to which wheel tires are put and this fact alone is the starting point of the success of the Ward method. The casting, being of a very high quality of copper, presents a very stubborn resistance to reduction of the wall thickness and necessitates a very sturdy construction of the working parts of the rolling machines. The main body of the machine was constructed of cast iron with extra heavy sections securely bolted to a base plate fastened to a concrete base. These extra precautions were absolutely necessary as the weight of the operation was inclined to pull the machine from the foundation. The system of gears was so arranged to give the greatest possible driving strength to the rolls, and were operated by a high powered individual motor. The shaft and bearings were of sturdy construction properly proportioned to the balance of construction. The rolls were made from tool steel properly hardened—the upper roll being stationary and approximately eight inches in diameter. The lower roll is movable and controlled by means of a hand lever and operated by an individual set of gears. The diameter of the lower roll was made so as to be suitable for easy access to the inside diameter of the cast band.

The band, as it came from the foundry in casting form, was placed in an oil fired furnace and heated to approximately 1200° F. It was then placed on the bottom roll inside the collar designed to secure the proper width of the finished band. After the band is properly placed,

the operator pulls the hand lever downward, thereby moving the lower roll up to the upper roll at which time the reduction of the wall thickness of the band begins and is gradually completed by further pressure and adjustment on the hand lever. A stationary sizing die received the band as it enlarges and controls the required outside diameter of the band. The rolls travel at a speed of approximately 50 R. P. M. and the average time required to roll a band 100% is about one minute. The

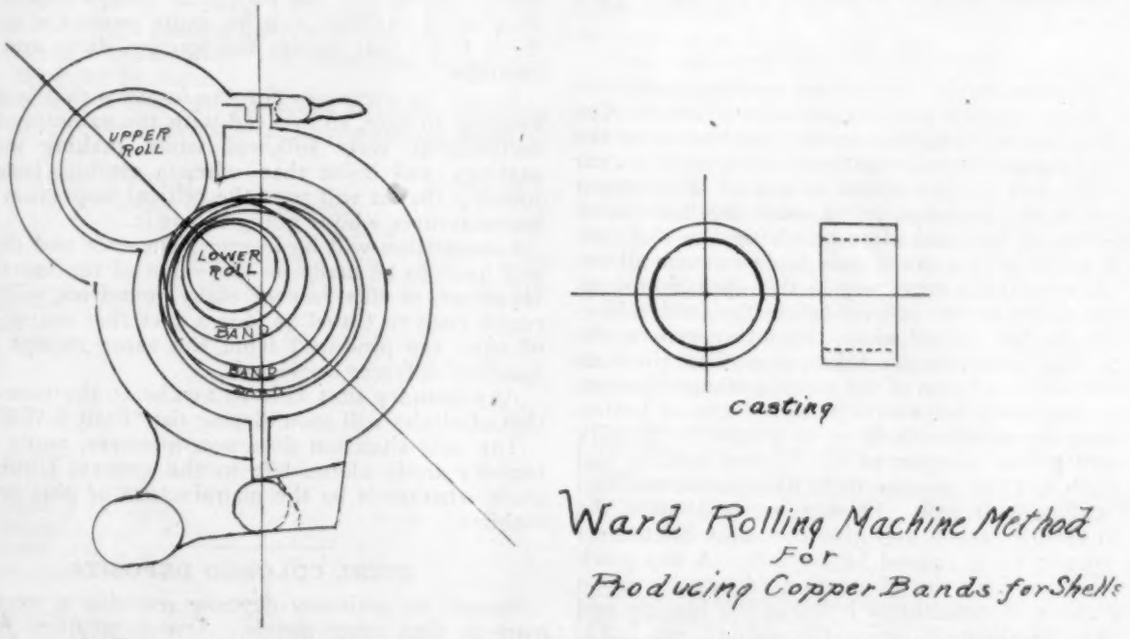

FIG. 5.—DIAGRAMATIC SKETCH OF ACTION OF WARD ROLLING MACHINE ON A COPPER BAND.

band is then placed in a tank of water to cool, later conveyed to an acid bath to remove the scale and to give a uniform copper color, then through two rinses of water and finally sized to insure correct inside diameter. The band is now ready to be faced and edged so as to procure accurate dimensions of thickness and width.

efficiency of the open flame Schwartz furnace for the successful smelting of pure copper.

I do not hesitate to venture the assertion that no one will doubt that pure virgin copper can be cast in sand and, after what has been successfully accomplished by the Rome Manufacturing Company after enormous expense of experimenting and persistent work in overcoming seemingly impossible obstacles in the face of very discouraging criticism by authorities on copper, any contrary argument is void of any truth or facts.

When the United States entered the war, it became necessary to equip and make plans for a larger production of bands. Instead of pure copper bands, the specifications called for Cupro-nickel which consisted

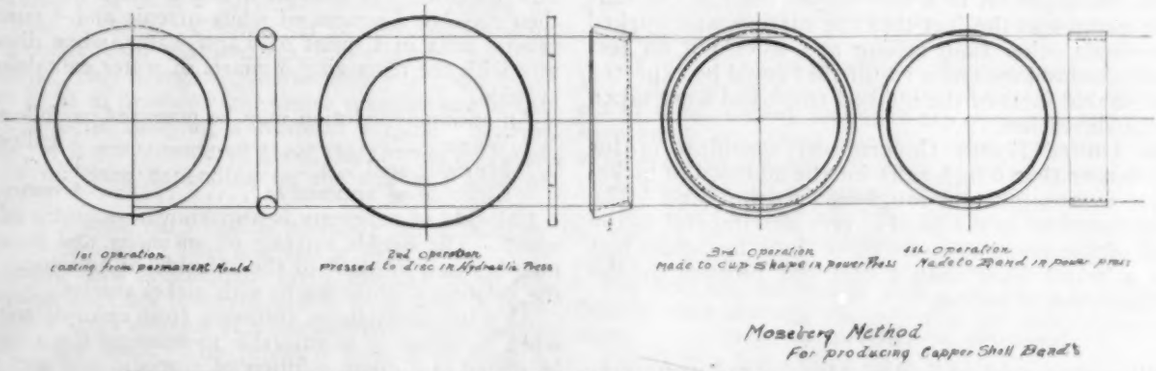

FIG. 6.—DIAGRAM OF STEPS IN MOSSBERG METHOD OF PRODUCING COPPER SHELL BANDS.

If you have carefully followed the description of the method employed, you will note that the grain of the metal is worked in the same direction as the periphery of the gun, thereby forming the grain in the right direction so as to insure the strength and toughness required of the band to give greater efficiency and accuracy in firing and of all tests made by the Government, none failed in regard to the physical test required. This satisfactory result also proves the

of 97½% copper and 2½% nickel. Once again we were brought to realize that our present method was not fast enough and not as efficient as the demand required. Various new methods were tried out and abandoned with the exception of one method, namely, the permanent mold. It took a long time and a lot of money to reach a position where the permanent mold was entirely satisfactory. However, this method was finally adopted and used for the manufacture of pure

copper and cupro-nickel bands. This method had a lot of advantages over the sand mold with reference to production, labor used, quality or product and cost of machining. The casting of copper or cupro-nickel rings is a very delicate proposition and great care must be used in melting the metal. The control of the cuprous oxide content is most important. Cuprous Oxide is to copper as carbon is to steel. However, the melter has no quick method of determining the oxygen and must rely on his experience to determine as to the oxide content necessary to produce good metal.

PREPARING THE METAL.

The following is the method we used to purify our copper and one which gave us entire satisfaction. The same fact, however, applies to this method as to the fact that an experienced chauffeur can operate his car successfully and a "greenhorn" cannot. The copper is melted in the presence of an oxidizing flame with the addition of flux and after removing the slag, the metal is poled with a green pole to decompose all the oxide. Great care is necessary in this operation so as to prevent either under- or over-poling the former leaving oxide in the metal while the latter causes the metal to rise. Samples are taken at various times to determine the toughness of the metal and usually more poling is necessary before the sample ingot or button shows that the metal is O. K. as to toughness, density and a fine grain. Copper of the desired quality and tough pitch will run into the mold like grease and has, what I call, a soft look. Over-poling will cause the metal to absorb carbon and give the same brittleness to the copper as is caused by oxygen. A dry pitch copper is caused by the absorption of oxygen while melting and will cause blow holes in the casting and also lack of ductility.

To my mind and experience, I am of the opinion that the casting of pure copper is the most difficult proposition the brass foundry trade has to deal with and requires more skill and care than any other metal. Poling and fluxing is important and in our experience, fluorspar is the best flux when used in the right way. The modulus of rupture of good copper should run 30,000 pounds per square inch.

The real objection to a cast copper band at the start of the game was the fact that the casting was worked by methods other than rolling and when put on test would not stand up, and a result that could be expected after the real facts of the method employed were taken into consideration.

The United States Government specification for bands larger than 6 inch calls for the addition of nickel to give a strength and toughness to the band. The nickel, however, in the band is very detrimental to the rifling of the gun and it does not show by actual test to be a better band than a cast one finished by the Ward process of rolling.

ANOTHER SUCCESSFUL METHOD.

Still another method was adopted for the manufacture of bands in a more efficient manner and gave the same results as a cast band finished by the Ward Rolling Method. This method consisted of casting a copper or cupro-nickel band in a permanent mold, then heating in an oil fired furnace and delivered at the rate of four thousand each ten hours, to a powerful hydraulic press where the band was pressed into a disc shape and to the required thickness of the finished band. The band was then cooled by dipping into water and taken to a power press where it was cupped and drawn into a finished band and edged on a floor lathe, which operation completed the band. This method is known as the Mossberg Method and is the result of experimenting and research work on the part of Mr. Frank Mossberg of Attleboro, Mass. Fig. 6 shows the various operations.

LESSONS FROM THE WAR.

One thing this War has taught us is efficiency. The manufacturer has had proven to his own satisfaction that brass castings can be made perfectly and that there is no real excuse for spongy, dirty and rough castings.

It will be necessary for the foundry that wishes to keep up to date, to proceed with the same production methods as were followed while making munition castings and insist that when a casting leaves the foundry that it will pass the critical inspection of the manufacturer who is going to use it.

Competition will be keener than ever and the fight will have to be made on the value of the metal used. However, in this respect many foundries will find a rough road to travel as it is a fact that many grades of cake are produced from the same receipt in the hands of different individuals.

Any foundry that fails to awake to the new condition of affairs will soon display the "FOR SALE" sign.

The new situation does not, however, apply to the foundry trade alone, but to the general commercial trade whether it be the manufacture of pins or automobiles.

STEEL COLORED DEPOSITS

Arsenic or antimony deposits resemble a steel color more so than other metals. Arsenic solutions may be prepared as follows:

Water	1 gallon
Sodium cyanide	6 ounces
Sodium arsenate	4 "

Anodes of soft sheet steel may be used. The solution should be used at about 120 degrees Fahr. with 3 to 4 volts. To prepare the solution dissolve the sodium arsenate in half the water, the cyanide in the other half and mix together. If sodium arsenate cannot be obtained then dissolve 3 ounces of white arsenic and 4 ounces of caustic soda in 1 quart of warm water, when dissolved, mix with the remaining 3 quarts of water containing the cyanide.

An antimony solution may be prepared as follows:

Water	1 gallon
Muriatic acid	1 "
Chloride of antimony	4 ounces

Chloride of antimony is also known as butter of antimony. The double tartrate of antimony and potassium may be used in place of the chloride of antimony. Use the solution slightly warm with nickel anodes.

As water precipitates antimony from chloride solutions when in excess, it is advisable to immerse the articles to be plated in a dilute solution of muriatic acid and water before plating, drain well and plate direct in the antimony solution. The voltage should not exceed two volts.

A dilute nickel solution about 3 degrees Baumé with a little copper carbonate, previously dissolved in ammonia to a clear blue solution, gives a good steel gray deposit. Do not make additions of the copper and ammonia solution in excess of ¼ ounce at one time, the correct amount, however, can best be determined by experiment. A voltage of 2 to 2½ will be ample.—C. H. P.

MODERN METHODS APPLIED TO THE FOUNDRY

AN ARTICLE DEALING WITH THE SCIENTIFIC PRODUCTION OF METAL PRODUCTS. SECOND PAPER.

WRITTEN FOR THE METAL INDUSTRY BY W. R. DEAN, INDUSTRIAL ENGINEER, EXPERT ON FOUNDRY MATTERS.

CAUSES OF WASTE.

The causes should be classified and the amount of waste due to each cause should be tabulated and after a while from these reports you know which are the most glaring wastes and can go after them to put a stop to them or reduce them to a minimum. Wastes due to carelessness of employees can be reduced by means of disciplinary methods or through bonuses offered for low waste. These records should come under the inspection department and be compiled by them.

The record given in Mr. Knoepel's installing efficiency principles well illustrates a form for classifying losses or wastes.

Rejections in Foundry Month of

According to Causes.

Causes	Fault of: Men. No.	Men. Wht.	Material. No.	Material. Wgt.	Cores. No.	Cores. Wgt.	Miscl. No.	Miscl. Wgt.	Total. No.	Total. Wgt.
Dirty castings										
Cold shot										
Crush										
Fall-out										
Blow										
Hit by ladle										
Scabs										
Faulty closing										
Shrink										
Broken gates										
Broken cores										
Wrong cores										
Hard ramming										
Run-out										
Anchor moved										
Shook out too quick										
Pattern not right										
Crack in casting										
Pattern shifted										
Faulty mach. moulding										
Broken castings										

FIG. 3.

No factory or foundry is up-to-date without an adequate stores system and for the proper control of stores it is necessary to have a perpetual inventory record of the amount of stores on hand. It is also necessary to have an established maximum and minimum quantity established. This is regarded as necessary in good management so as to provide comfortable supplies and at the same time avoid carrying a wasteful surplus. Several forms of cards are considered good, the amount of detail necessary on them depending on the size and kind of business.

Fig. 4 is a style card that is adequate for a foundry and a small business. This is a 4x6 or 5x8.

The above card is adequate for a foundry when the consumption does not fluctuate widely from time to time and where a large amount of a comparatively few metals and alloys are used. The problem here is to keep a considerable amount ahead of the manufacturing needs. In a jobbing foundry this card will also cover supplies, etc.

Where a foundry is connected with a manufacturing plant the supplies are usually kept in the general storeroom and here a more elaborate form is necessary especially if it is a plant using a wide variety of stores. Fig. 5 shows such a form.

The following instructions can be placed on back of card.

Note—When stores are ordered, add the quantity to columns 1 and 4; when stores arrive, substract the quantity received from column 1 and add the quantity received to column 2. When stores are apportioned, subtract the quantity from column 4 and add quantity apportioned to column 3; when stores are issued subtract quantity from columns 2 and 3—in all cases bring down at once balance on hand in each column affected.

Please note that all stores ordered are considered available for future use and that all stores which have been apportioned to any order which is ahead of the factory are considered as no longer available for future consumption. These cards must go to the stores ledger clerk promptly so he can make the necessary entries and the balance brought down. If this record is not kept up-to-date it is useless. If kept up-to-date an annual inventory is unnecessary. Goods can be checked up whenever they get low and card inventory compared to physical.

This keeping of the balance of stores available for future needs enable the storekeeper to anticipate manufacturing needs to a greater extent than is possible under any other method.

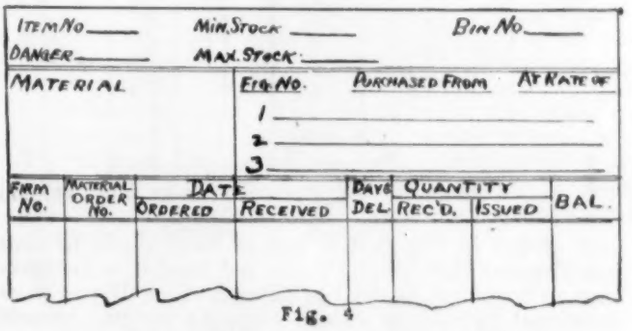

FIG. 4.—STOCK CARD FOR FOUNDRY.

By keeping such a stores record a plant cannot only anticipate its needs but can supply its storeroom needs with much less capital tied up than under a careless stores management.

The next thing to consider is the plant and equipment and what can be done to improve them or get the most out of them. Many foundries are over-equipped. They have ample machinery for the most prosperous times, while working at a low efficiency. During normal or dull times much of this equipment is idle.

The causes of this idle time may be roughly classified under lack of work, breakdowns, lack of operation, inefficiency of management, lack of orders.

The first step to remedy such a condition is to obtain detailed data showing the extent of the delay from each cause.

Fig. 6 is a lost time report card of a standard size. Four by six inches being a convenient size. As the shop increases in size and the delays begin to amount up in dollars and cents a more detailed form of classification or subdivision can be carried out. For instance, subdivisions as to time lost, cause could be made.

Figure 7 shows how this could be carried out. You will note a loss of 91 hours for the month which is possible in a shop of several moulders and where there is no planning department; take 20 moulders and have each lose a half hour per day and you have 10 hours lost and I

have seen this occur in a jobbing shop. Moulders losing time waiting for their next job, is a common occurrence rather than the exception. Ninety-one hours at 60 cents per hour is $54.60 for the month, carry this for all losses and see the startling amount of money lost each month. A good deal of this could be saved. A planning department would save all lost waiting for jobs. While checking up the losses and calling the foreman's attention to them will soon have a beneficial effect. In using the

In Fig 7 you will notice a good many chances for delays are directly up to the inefficiency of management and should be charged against the management, since under modern practice the management should relieve the worker entirely of the responsibility in these matters.

If machines are idle or benches empty for lack of work, the delay reports should be based on the machine as a unit and a report should be turned in for a machine whether it is manned or not. The usual practice in the

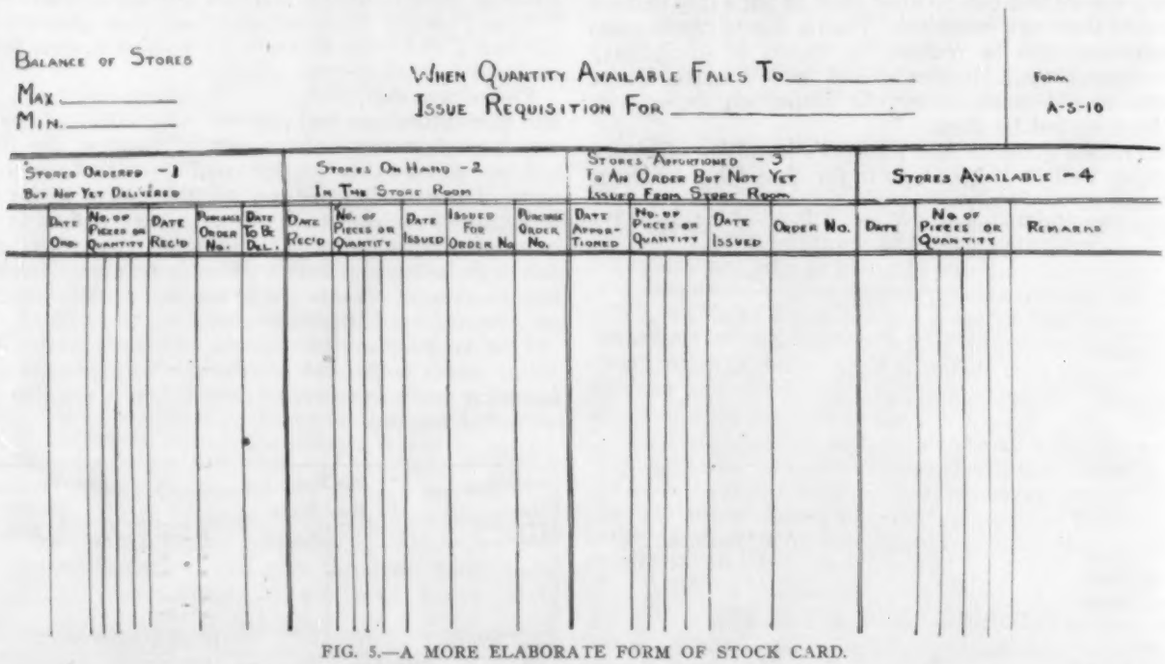

FIG. 5.—A MORE ELABORATE FORM OF STOCK CARD.

card shown in Fig. 6 it is best to hand a pad to each moulder and have him fill it out and hand it to the foreman or inspector at the end of each day. If you have functional foreman or a small shop, the foreman himself can fill it out. The foreman or inspector O. K.'ing the

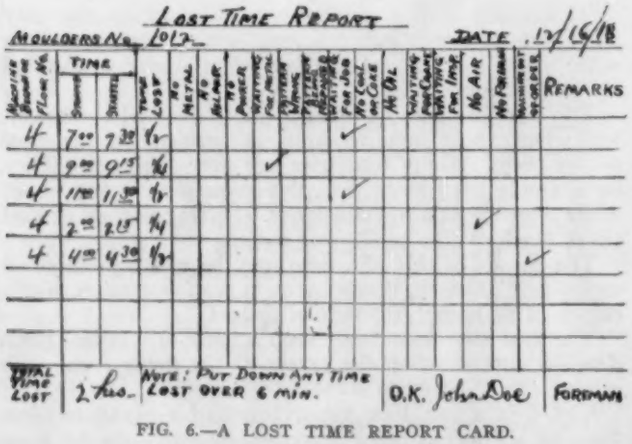

FIG. 6.—A LOST TIME REPORT CARD.

card eliminates the carelessness of an operator putting down anything he wants to. It is extremely desirable that the foreman reduce to a minimum these delays and his O. K. on the cards should bring to his attention any excessive delays. Fig. 8 will check him up and from these cards a monthly report or graphs should be made of those losses that are higher than should be and sent to factory or foundry manager to be sent finally to the general manager, if they don't show a decided reduction.

past has been to regard this idle equipment as an overhead charge which is apportioned to the product made. The best practice now is to regard idle equipment as a

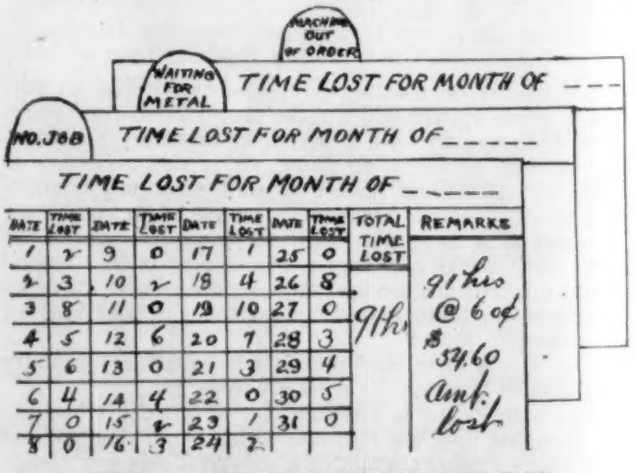

FIG. 7.—A MORE COMPLETE LOST TIME CARD.

business expense due to market conditions or to the inefficiency of the selling department and charge it to profit and loss.

Whichever way is followed, the main point is to keep all machines going at all times or else bring the fact to the attention of the general manager, at frequent intervals so that he can use all possible means to reduce the amount of idle time. Machinery which is idle a good deal of the time and cannot be made productive should be sold.

(To be continued.)

MANGANESE BRONZE*

A Paper To Be Presented at the New York Meeting of the Institute of Metals Division of the American Institute of Mining Engineers, February 17-20, 1919

By P. E. McKinney,† Washington, D. C.

Developments in engineering during the past decade, particularly as applied to marine construction, mining machinery and other purposes in which corrosion offers a serious problem, have created a large demand for a nonferrous metal highly resistant to corrosion and at the same time useful in general construction work as a substitute for steel without materially decreasing the factor of safety or increasing the weight of the various parts over that ordinarily used in the case of mild steel. To obtain the combination of desired properties many compositions have been proposed and used with excellent success, but at the present time probably the most popular and most widely used combination is the nonferrous alloy commonly called manganese bronze. This is nothing more than a high brass to which have been added, by the proper method of alloying, comparatively small percentages of aluminum, iron, or manganese with the definite purpose of strengthening the alloy and rendering it more dense and close-grained than the average yellow brass casting.

In the manufacture of manganese bronze a great deal has been said about the importance of using only the highest grades of raw material and the beneficial or detrimental effects, as the case may be, of various impurities, as well as the importance of adding the ingredients according to various formulas proposed; but in most of these cases the literature on the subject has dealt principally with the manufacture of this alloy from virgin metals and raw materials of the highest purity. It is the purpose of this paper to deal particularly with the possibilities that lie in the proper development of methods for manufacturing such an alloy by more economical methods than those which have usually been discussed in other literature on the subject. Shortages have recently existed in raw materials needed for many products entering into the various branches of engineering work, particularly the nonferrous metals, and during the next few years of reconstruction the country will be flooded with many byproducts and much scrap resulting from the extensive operations carried on during the period of the war, during which time scrap and byproducts could not be handled in sufficient volume to effect rapid production. These facts constitute conditions that make a project looking toward the efficient utilization of such materials well worth while.

When manufacturing manganese bronze or a similar alloy from raw materials there is intentionally added a percentage of iron, which is generally conceded to be one of the very objectionable impurities in nonferrous scrap, in addition to which aluminum and manganese are added, and sometimes tin in small quantities, all of which if present in the virgin metals ordinarily used in nonferrous foundry practice would be considered detrimental impurities. The composition of the average manganese bronze is as follows:

	Per Cent.
Copper	57 to 59
Zinc	38 to 40
Iron, manganese, aluminum, tin	0.25 to 1
Lead	0.1 to 0.5

This composition shows rather clearly that there is no necessity for the use of high-grade raw materials, provided methods of manufacture can be devised to produce the proper refinement of the finished product, as the ordinary impurities encountered in nonferrous materials offer no serious obstacles when the same elements must be added in considerable percentages to effect the desired composition.

In the manufacture of manganese bronze it has been found possible to utilize what would ordinarily be termed material of very low grade, such as, skimmings from the foundry, particularly skimmings and dross ordinarily recovered from brass rolling mills or cartridge-case plants, zinc dross recovered from galvanizing plants, aluminum turnings that are ordinarily unrecoverable without serious loss and deterioration of the product due to oxidation, etc., and other byproducts and scrap metals that ordinarily are not usable as remelting scrap in foundry practice. The manufacture of high-grade manganese bronze from materials of this class, however, cannot be attempted in crucible furnaces, or practiced only on a comparatively small scale, as there is required a reverberatory or other furnace in which it is possible to accumulate a bath of considerable volume and in which the charge of metal can be worked in the same manner as in other refining processes producing on a large scale in open-flame furnaces. The idea is so to compound the various materials available as to cause one to react with the other to the mutual benefit of all the ingredients going into the charge. A typical charge for operating a reverberatory furnace in the manufacture of manganese bronze is as follows:

	Pounds
Yellow brass machine shop turnings	1250
Zinc dross from galvanizing plant	400
Aluminum turnings	30
Recovered scrap zinc	400
Dross and skimmings from billet and slab plant	2000
Foundry-floor scrap and skimmings	650
Hardener made by melting scrap copper and manganese in equal proportions	250
Charcoal	75
Common salt	80

With a knowledge of the general chemical composition of each ingredient going into the charge it is easy to produce a manganese bronze that will have the desired composition and will require no other treatment than, possibly, the addition of a little zinc when remelting for casting purposes.

When handling a charge such as that just shown, advantage is taken of impurities, such as the iron existing in the zinc dross, the small percentages of tin in the machine-shop turnings, etc., in figuring the final desired analysis of the alloy. It is a well-known fact that such materials as zinc dross and foundry skimmings, both of which are full of dirt and oxides, cannot be recovered in a usable condition when melted separately in crucibles or by any of the ordinary methods of melting material, without an excessive loss due to volatilization. But when the well-known reactions occurring in the manufacture of old-fashioned calamine brass are taken into consideration, it can be seen how the combination of zinc dross, brass skimmings, and other highly oxidized materials melted

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†Chemist and Metallurgist of the Naval Gun Factory, U. S. Navy Yard.

in contact with charcoal will produce an alloy about as well deoxidized as the average high-zinc brass. Contact while in a molten or semi-molten state of metallic copper and partly oxidized zinc in the presence of charcoal develops a condition extremely conducive to a thorough deoxidation and alloying of all the metallic ingredients. This reaction, together with the well-known deoxidizing effects of aluminum, manganese and iron, which are part of the charge, contributes to the production of thoroughly deoxidized and dense material. Salt is used as a flux on account of its excellent properties for gathering and fluxing off the dirt from the charge, the oxides of iron, manganese, etc., and the reduction of any copper oxides passing from the bath into the slag.

In charging the furnace, it is the usual practice to place the manganese hardener in the bottom of the furnace and on top of it place the cartridge-case dross and zinc dross with a layer of charcoal, after which the foundry skimmings and turnings are added and the charge is melted, with occasional rabbling to clear the metal and bring all the ingredients into intimate contact. When the bath is melted, the aluminum scrap is added and the necessary zinc additions are made, after which the charge is allowed to cool slightly in the furnace and is poured into ingots for remelting purposes, after analysis has been made to determine the necessity of adding zinc or otherwise correcting the composition by the mixture of several heats in order to obtain the desired composition.

The foregoing process carried out by a skilled melter will produce an alloy that is absolutely sound and homogeneous and capable of being cast in ordinary foundry practice in the same manner as any of the so-called high grades of manganese bronze, and will produce most excellent physical properties in the finished casting.

As instances of what can be obtained, the following results of tests are given. These tests were made on castings produced by the method described from initial charges of raw material practically identical with the typical charge given.

Table 1.—Analyses of Ingots as Poured from Reverberatory Furnace.

	Copper, per cent	Zinc, per cent	Tin, per cent	Lead, per cent	Iron, per cent	Aluminum, per cent	Manganese, per cent
Heat A.	57.95	39.08	0.35	0.42	0.83	0.59	0.77
Heat B.	57.18	39.54	0.51	0.34	1.04	0.48	0.91

Table 2.—Physical Values Obtained on Sand Castings Poured from Remelt of Ingots without Additions.

	Tensile strength, lb. per sq. in.	Yield point, lb. per sq. in.	Elongation, per cent.
Heat A.....	67,700	46,300	22.1
Heat B.....	72,100	50,400	21.0

Table 3.—Physical Tests of Sand Castings Made from Manganese Bronze Produced by Process Described

Tensile strength, lb. per sq. in.	Yield point, lb. per sq. in.	Elongation, per cent.
67,300	45,800	29.9
66,400	37,400	30.9
67,700	41,200	24.5
72,200	34,100	24.5
67,900	33,900	28.1
72,600	36,700	23.4

In addition to the excellent properties shown in the tensile tests, the material corresponds in every other physical respect to so-called high-grade manganese bronze produced from virgin metals, has a fine uniform fracture with a tendency to silky grain in many cases and shows toughness and resiliency equal to any other grades of manganese bronze examined.

Some objections may be raised to the use of byproducts and scrap material in the manufacture of manganese bronze because the lead content of some of these byproducts is quite high and will introduce into the alloy quantities of lead higher than are desired. It is believed, however, that the results of tests made from time to time on manganese bronze containing in some cases a considerable percentage of lead have shown conclusively that lead within reasonable limits is not detrimental. No concrete cases have as yet been cited in which, other things being equal, lead under 0.75 per cent has shown seriously detrimental effects on the alloy. All the samples on which physical tests are given contained percentages of lead ranging from 0.25 to 0.50 per cent, yet none of them show in the test results any detrimental effects due to the presence of this so-called impurity. It is believed that the tolerance of a slightly higher content of lead in specifications for manganese bronze would, in general, serve admirably as a conservation measure for high-grade virgin material and offer excellent opportunities for the utilization of many metallurgical byproducts that at the present time constitute practically useless material.

The results obtained after about 3 years of operation under the process described have shown rather conclusively that the alloy commonly known as manganese bronze can be produced without resorting to the use of high-grade virgin materials with the addition of what would ordinarily be termed detrimental impurities, by the simple application of some of the well-known laws of metallurgy.

CHAMPNEY'S METHOD OF DIE SINKING.

This method was originated by George F. Champney, Bridgeport, Conn., a very long time ago. He operated at one time under the name of the Patent Steel Die Company, and made dies for the forging and jewelry trade. His method was the first example of what is known as the High Drop Method of Die Sinking. Briefly, his method consisted of using a hammer weighing 3,200 pounds, which traveled on ways 80 feet high. This weight or hammer-head was raised to any point on these ways by means of a windlass and was released by means of a latch operated by a rope. The first step in the making of a die was to make a model of plaster of paris, which was carefully smoothed and a cast-iron casting made from it. This "type or hub" was attached to the hammer-head by means of keys, which is the usual manner of attaching a die to the hammer-head now. The die to be sunk was heated red-hot and placed in a holder set into the foundation of the hammer frame. The die was set into a square hole in this holder and shimmed up on the sides, so that it was impossible for the metal to flow sidewise. The holding fixture or base itself was 3 feet in diameter and 10 inches thick. With the die heated red-hot and placed into position, the hammer-head was raised to whatever height the operator deemed sufficient, which varied according to the size of the work, and was then released, the hammer-head falling and driving the model or hub into the red-hot die, forming the impression. The die block was then removed and machined off sufficiently to give the proper clearance; the impression made by the hub was scraped and smoothed out and then the die was hardened as usual. An important feature of this process was a catch or lock on the ways which caught the hammer-head as it rebounded from the first stroks and prevented it from striking the die a second time, which would have been fatal to good results.

ETHAN VIALL,
Managing Editor *American Machinist.*

PREPARATION OF CRUCIBLE GRAPHITE

SOME INFORMATION REGARDING THE USE OF AMERICAN GRAPHITE FOR METAL MELTING CRUCIBLES, CONTAINED IN A REPORT* JUST ISSUED BY THE BUREAU OF MINES.

BY GEORGE D. DUB OF THE BUREAU.

This report describes graphite investigations made by the Bureau of Mines in connection with the so-called War Minerals Investigations and also outlines work contemplated to solve the problems with which the graphite-mining industry of this country has been contending since its inception.

During the past two years, imports of graphite have totalled eight times the domestic production. The problem as regards shipping resolves itself into a consideration of crucible graphite because in the past, most of the material used in the manufacture of crucibles has been imported overseas from Madagascar and Ceylon, while the domestic mining industry remained undeveloped. Madagascar and Ceylon have furnished about 70 per cent of the total graphite imported, and of this amount approximately 90 per cent has been used in crucible manufacture. Amorphous graphite from Korea is replaced without difficulty by similar material obtained from Mexico, which could in turn, if the necessity arose, be replaced by development of somewhat lower-grade deposits in the United States.

The use of domestic graphite before 1915 was confined largely to the manufacture of lubricants, etc., with a comparatively negligible quantity being utilized in crucibles. In that year, because of the quickened demand for graphite crucibles occasion by the placing of foreign contracts with American plants, and by the poor service rendered by crucibles made from clay, other than the Klingenburg, certain crucible manufacturers, fearing a shortage in the supply of overseas graphite, offered high prices for domestic flake graphite. This situation furnished a stimulus for the intensive development of the Alabama field, which because of the availability of the graphite-bearing rocks, readily responded. The panicky feeling regarding the supply of overseas graphite resulted also in the use by crucible manufacturers of a larger amount of domestic graphite than had previously been employed in their mixtures.

Until the United States entered the war in 1917, the use of Ceylon and Madagascar graphites by American manufacturers was unrestricted so long as guaranties could be furnished to the British and French governments that the products into which overseas graphite entered as a constituent would not fall into the hands of the enemy. Upon the declaration of war in April, 1917, these guaranties became unnecessary, as they were absorbed into broader American defense measures.

During the interval, in the winter of 1917-1918, when freight conditions were most congested, an embargo against the shipment of domestic graphite was ordered and permitted to remain in force until the early part of March, 1918. The result of this embargo was a stagnation of the domestic mining industry. The removal of the freight restriction on domestic graphite was followed in April by a complete embargo on importations of overseas graphite during the interval April 15, 1918, to July 1, 1918. For the remainder of the calendar year 5,000 long tons was to have been permitted to enter this country. This order was modified to the extent of allowing importations during the period April 15, 1918, to July 1, 1918; the total amount of these imports, however, was to have been deducted from the 5,000 tons scheduled to enter during the last six months of the year.

Toward the end of June, 1918, in view of the necessity for conserving shipping for the direct military program and after learning that stocks of overseas graphite in the hands of crucible makers, refiners, and dealers were sufficient to last about six months, it was decided after July 1, 1918, to restrict completely the importation of overseas graphite for the balance of 1918. This order was followed on August 10, 1918, by a request from the War Industries Board that all crucible makers use 20 per cent domestic flake graphite in their crucible graphite mixtures for the balance of 1918 with an increase to 25 per cent for 1919. This request carried with it the statement that applications for import licenses of manufacturers not complying with the provisions of the request would not be approved by the War Industries Board.

The War Trade Board ruling of July 2, 1918, was superseded on October 17, 1918, by a ruling permitting imports of overseas graphite by manufacturers whose applications had been approved by the War Industries Board. The purpose of this latest ruling is to permit the carrying of three or four months' supply of graphite, in view of the length of time required for shipments from Ceylon and Madagascar to reach the factory in which they are used.

ESTABLISHMENT OF PERMANENT DOMESTIC INDUSTRY

Before the declaration of war in 1914, all crucible makers without exception used clay imported from Klingenburg, Bavaria, in the manufacture of crucibles. Little work of any kind had been done with domestic or English clays. With the declaration of war, the source of clay was, of course, immediately cut off and the crucible maker was forced to turn his attentions to the utilization of clays other than the German. Although at first serious difficulties were encountered, the clay problem is now fairly well in hand with the result that crucible efficiency compares favorably in service with pre-war standards. Having surmounted clay difficulties to a large extent, the problems of crucible manufacture were considered solved. In the course of experiments, no great success attended the use of more than 25 per cent domestic flake graphite in crucible graphite mixtures. It was, therefore, fitting that the Bureau of Mines should investigate thoroughly not only the use of domestic flake in crucible manufacture, but also methods of manufacturing crucibles from this material.

The future of the graphite industry and the effect of improvements and changes in the brass and steel industries have been well outlined by Ferguson.* If new and increasing uses can be developed for graphite, it may be possible through the manufacture in the various mining districts of graphite articles o commerce to establish the domestic mining industry on a firmer basis than is possible with the activities of many small operating units which bend all their efforts to the production of crucible stock. The latter state of affairs leaves No. 2 flake and dust as by-products which are drugs on the present market. The graphite-mining industry reflects a healthy response to the market for crucible grades created by the recent request of the War Industries Board, and it would be unfortunate if, with the re-establishment of peace, this industry should revert to its pre-war basis.

*War Minerals Investigation Series No. 3, United States Bureau of Mines.

*Ferguson, H. G., Graphite in 1917; Mineral Resources, U. S., 1917, U. S. Geol. Survey, 1918, pp. 97-119.

PROGRAM OF INVESTIGATION.

The program as planned by the War Minerals Investigations called for a six-fold division of work, as follows:

(1) A survey of present mining, milling, refining, sampling and analyzing methods.

(2) Experimental work on concentration and refining to improve present practice.

(3) Experimental work in crucible manufacture to determine the properties of domestic flake and the maximum proportions that might be used without impairing the quality of crucibles.

(4) Photomicrographic work on crucibles.

(5) The establishment of a standard method of sampling finished graphite.

(6) The development of a standard method for the rapid and accurate chemical analysis of graphite.

The experimental work on concentration and refining was assigned to the Salt Lake City Experiment Station of the Bureau of Mines. The experimental work in crucible manufacture was assigned to the Columbus Station, while the photomicrographic work and chemical analysis was assigned to the Pittsburgh Station.

The object of this report is to describe the methods of mining, concentrating, and refining graphite and to suggest a standard method of sampling finished graphite.

During the course of the field work, the principal producing fields—Alabama, New York, Pennsylvania and Texas—were visited as well as a plant in which graphite is refined from "kish," a by-product obtained from iron blast furnace and steel plants.

THE MANUFACTURE OF WHITE METAL FOR FRICTION BEARINGS

A PROCESS FOR THE PRODUCTION FROM LEAD, ANTIMONY, COPPER AND TIN, OF WHITE METALS CONTAINING SILICON AND SUITABLE FOR BEARINGS

This invention relates to a process for the manufacture of white metals suitable for bearings, composed mainly of lead, but containing in addition small quantities of antimony, copper and tin, together with a certain amount of silicon, which may, to a certain extent, serve as a substitute for the antimony and tin without injuriously affecting the hardness of the resulting alloy. The practical limits of hardness obtainable lie between 24 and 35 according to Brinell's scale.

Alloys of lead, antimony and tin which contain from 2 to 3 per cent. of copper are already known, the copper being added for the purpose of counteracting the tendency to segregation of these alloys, although its presence renders them somewhat brittle. Now the addition of silicon obviates this defect, even when the amount of copper added exceeds the usual proportion, and, moreover, considerably increases the tenacity of the alloy. The presence of silicon, moreover, lowers the temperature of solidification of the fused antimony copper alloy, with the result that mixed antimony-copper crystals will be separated out during the solidification at a somewhat later period than would otherwise be the case, say, at a temperature of about 500 deg. C. The copper remains dissolved for a longer period in the molten mass and consequently enables the antimony to absorb more of it. The eutectic of the entire alloy will consequently be much denser, and the tenacity of the resulting white metal will be correspondingly increased. It is quite sufficient if the temperature of fusion of the liquid copper mass is lowered by from 100 to 120 deg. C. before the antimony is added. By adding from 4 to 6 parts by weight of a 30 per cent. silicon-copper to an auxiliary alloy H, consisting of from 56 to 62 parts of antimony and from 40 to 32 parts of copper, the temperature of fusion of H can be reduced to an extent that exceeds by from 30 to 35 degs. the corresponding temperature when no silicon-copper alloy is added.

The production of the white metal itself is effected by first fusing 76 parts of lead with 24 parts of a preliminary alloy V, which is obtained by fusing from 15 to 35 parts of the auxiliary alloy H together with sufficient of equal quantities of antimony and tin to make up the 100 parts. According to the degree of hardness it is desired to impart to the white metal, any desired number of parts of lead can be employed, together with a sufficient number of parts of the preliminary alloy V to make up the 100; the practical limits being situated between 15 and 35 parts per 100 of the preliminary alloy V.

The purpose of adding the auxiliary alloy H, which as already stated is rich in copper, to the preliminary alloy V is to regulate the temperature of solidification of the final alloy. For instance, by adding 25 per cent. of the auxiliary alloy H to the preliminary alloy V it becomes possible so to modify the solidification temperature that solidification commences at 410 deg. C. instead of at 380 deg. Co.; with the result that the mixed antimony tin crystals will be separated out from the final alloy at a later period, say in the vicinity of the temperature at which lead solidifies. But as a certain hardness of the final alloy presupposes the presence of certain definite quantities of copper and antimony it is still necessary that the separating out of the antimony-tin crystals should not take place too soon, as otherwise a longer period during which the lead-antimony eutectic will remain liquid will set up a tendency to segregation, with the result that the alloy will become brittle and friable. By adding the auxiliary alloy H, containing copper and antimony, to the preliminary alloy V, it, however, becomes possible to bring about the necessary rise in the solidification temperature of V, and consequently also to regulate the solidifications of the final alloy in a completely satisfactory manner. The solidification curve will consequently represent a continuously progressing line.

From the final alloy the antimony-tin crystals will separate out at a temperature of 320 deg. C. whilst in the case of an alloy of lead, antimony, copper and tin, to which no silicon is added, the separating out will occur at a temperature which varies between 385 and 350 deg. C., and is consequently about 65 deg. lower. In the latter instance, however, the texture of the alloy will be much less uniform and by no means so dense.

The essential novelty of the process may be summarized in the statement that for the purpose of producing a preliminary alloy there is employed an auxiliary alloy, by means of which the temperature of solidification of the preliminary alloy is intentionally raised, and that silicon is added for the purpose of reducing the temperature of fusion of the auxiliary alloy in order to bring about the enrichment of the antimony by copper.—*Foreign Exchange.*

ACIERAL

It is reported that the composition of the new strong aluminum alloy known as Acieral is as follows:

Copper	6.00 per cent
Nickel	1.00 per cent
Iron	1.25 per cent
Aluminum	Balance

DIE CASTINGS AND THEIR APPLICATION TO THE WAR PROGRAM

A Paper To Be Presented at the New York Meeting of the American Institute of Mining Engineers, Institute of Metals Division, February 17-20, 1919

By Charles Pack,* Brooklyn, N. Y.

Die castings may be defined as metal castings made by forcing molten metal, under pressure, into a metallic mold or die. It is necessary to keep this definition in mind to avoid confusing this process with other permanent-mold casting processes. The fundamental principles of the process have been known and practiced many years. The simplest application is embodied in the modern lino-

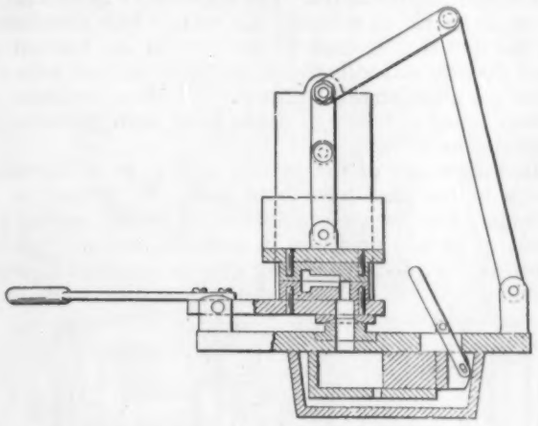


FIG. 1.—UNDERWOOD DIE-CASTING MACHINE.

type machine in which moldten metal (usually tin-lead alloy) is forced under pressure into a metallic mold. The pressure is derived from a piston and cylinder immersed in the molten metal. Progress in the art of die casting may conveniently be divided into three groups: Machine for imparting pressure to the metal, material for the die or mold, casting alloys.

CASTING MACHINES.

The problem of delivering molten metal under pressure into a die is comparatively simple, when dealing with low-fusing-point alloys, as the alloys of lead and tin, but it is much more complicated when dealing with metals of higher fusing points, such as the alloys of zinc, aluminum, and copper. Although the art of die casting is comparatively new and, to a large extent, unknown, the records of the patent office are replete with patents on the subject.

Fig. 1 shows an Underwood machine patented in 1902; this is probably one of the first machines designed for the production of commercial die castings. The relation of this machine to the linotype casting machine is clearly apparent. A cylinder and piston are immersed in the molten metal so the application of power to this piston forces the molten metal, under pressure, into the mold or die. The Doehler machine, Fig. 2, patented in 1907, is based on the same general principles. This machine is used to a large extent at the present time, throughout the United States, for the production of zinc, tin, and lead alloy die castings.

In the machine shown in Fig. 3, patented by Doehler in 1910, compressed air is used for forcing the metal into the die. In Fig. 4 is shown another of this type of machine. Here compressed air is applied to the surface of the molten metal to force it into the die.

In a machine patented by Chandler in 1914, shown in Fig. 5, the principle of the internal-combustion engine is applied for exerting pressure on the molten metal. A charge of gasoline vapor and air is injected into the melting chamber, the explosion of which forces the metal into the die.

The writer never heard of this machine being used on a commercial basis, but it is mentioned to show the various means suggested for forcing molten metal into a die.

METHODS USED TO AVOID BLOW-HOLES.

The fact that die castings are made under pressure would suggest, on first thought, dense and homogeneous castings; this impression, however, is not in accord with actual practice. On fracture, the pressure die casting will be found to consist of a dense closely grained outer stratum and a porous inner stratum. Blow-holes of varying size may be expected in the center of the die casting, particularly through heavy sections. Many machines have been designed with the primary object of overcoming this difficulty and producing solid die castings.

Fig. 6 shows an air operated die-casting machine with the die inclosed in a vacuum chamber. The inventor evidently assumed that the only cause for blow-holes in the casting was the presence of air in the die. In Fig. 7 is shown another die-casting machine in which the vacuum principle is applied; here the vacuum is applied directly to the die.

The production of die castings free from blow-holes

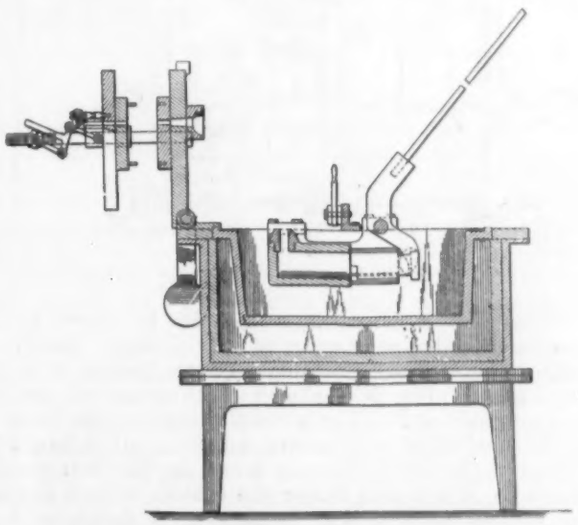


FIG. 2.—EARLY TYPE OF DOEHLER MACHINE.

has been the most serious problem confronting die-casting manufacturers. At various times it has been stated that processes capable of producing solid and homogeneous die castings have been developed. If all blow-holes in die castings were caused by air coming in contact with metal, the vacuum process would deserve consideration. That the presence of blow-holes in some die castings are due to other and more serious causes, the writer will endeavor to prove.

In Fig. 8 is shown a cross-section of a casting that can be gated at *A* or *B*; in the best foundry practice the gate *A* would probably be used. The first metal that goes into the die will chill around the inner walls and take

*Chief Chemist, Doehler Die Casting Co., Brooklyn, N. Y.

the form shown in the shaded portion. The gate may then become chilled before the inner portion has been filled; this will cause blow-holes that no vacuum will eliminate. A similar effect will be produced if the metal was too cold at the time of casting. The writer has produced castings having only an outer shell, similar to that shown in Fig. 8, by limiting the amount of metal injected into the die to a quantity less than that required to make the casting. A similar result may be obtained by running the metal so cold that it will chill the thinner sections of the casting before the heavier sections are completely filled. Lack of pressure will produce the same result.

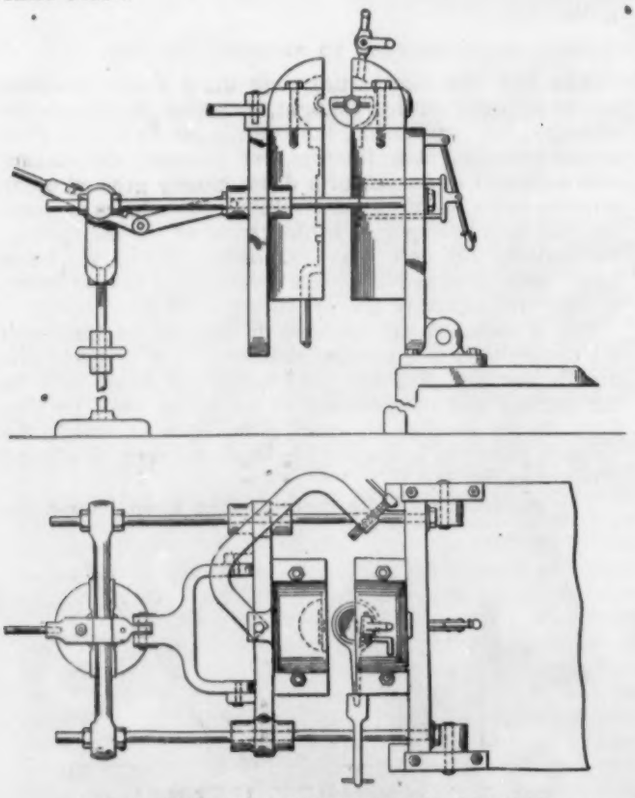


FIG. 3.—DOEHLER COMPRESSED-AIR MACHINE.

Blow-holes in die castings may also be caused by the phenomenon that we sometimes call "piping." Makers of rolling-mill ingots have often been confronted with this problem. In Fig. 9 is shown cross-section of another casting gated at *A*. The metal flowing into the die at *A* will fill the entire mold cavity, assuming all casting conditions to be ideal, but the metal in the thin section adjoining *A* will chill before the heavier section so that, the chilling being from the outside, a shrinkage hole will be left in the center. Here again no advantage can be gained by the use of the vacuum system.

DIES.

In the manufacture of die castings from zinc, tin, and lead alloys, dies made from low-carbon machine steel last almost indefinitely and answer every purpose. In the first attempts to die-cast aluminum, the problem of obtaining a suitable die material presented serious difficulties, which were described by the writer in a paper read before the American Institute of Metals in 1915. This problem, however, has been solved by the use of various alloy steels so that the die casting of aluminum and its alloys constitutes the greater part of the die-casting industry of today. The proper gating and venting of these dies are problems that arise daily and on the solution of these problems depends the success or failure of the process.

ALLOYS.

In a paper read before the American Institute of Metals in 1914, the writer described the various types of zinc, tin, and lead alloys used in the die-casting process. The application of these alloys and their limitations were also pointed out. At that time the die casting of aluminum and its alloys was barely beyond the experimental stage. During the past 4 years, the most important advance in the perfection of the process for die-casting aluminum and its alloys. The importance of this achievement as an aid to winning the war is best demonstrated by the fact that at least 95 per cent of the die-cast parts used directly or indirectly as materials of war were made from an aluminum-base alloy. Of these castings, only a very small percentage could have been produced successfully in 1914.

Investigations of the casting properties of metals and alloys in the past have been generally limited to sand castings; few data are available as to the casting properties of metals or alloys in metallic molds. Just what constitutes a good die-casting alloy is a subject of unusual interest. A few of the important requirements, outside

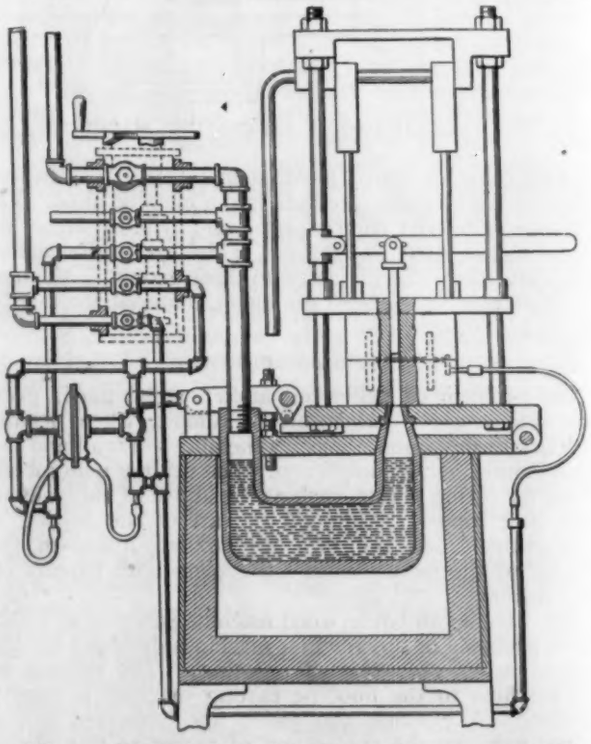


FIG. 4.—ANOTHER TYPE OF COMPRESSED-AIR MACHINE.

of the usual physical properties demanded of alloys, are:

Melting Point.—The successful die-casting machine in every instance is constructed of iron, in one form or another. The melting point of the alloy must be such that it will melt readily in an iron pot.

Solvent Action.—The solvent action of the alloy on iron must not be too great. Molten aluminum dissolves iron very rapidly and analyses of aluminum die castings on the market will show an iron content of from 1 to 3 per cent, due to the solvent action. Fortunately, there is no serious objection to the presence of iron in oluminum casting alloys. Should the aluminum absorb much above the 3 per cent iron, the melting point becomes too

high and the alloy becomes viscous and unsuitable for making castings.

Elongation.—The elongation or, to use a simpler term, the stretch of the metal is of vital importance in determining the die-casting properties of an alloy. Not only is it desirable to know the elongation of the alloy when cold, but it is of greater importance to determine the elongation at various temperatures ranging from the melting point of the alloy down to normal temperature. The reason for this becomes apparent when the physical phenomena of the die-casting process are considered. Let us assume that a ring 12 in. (30.48 cm.) in diameter is to

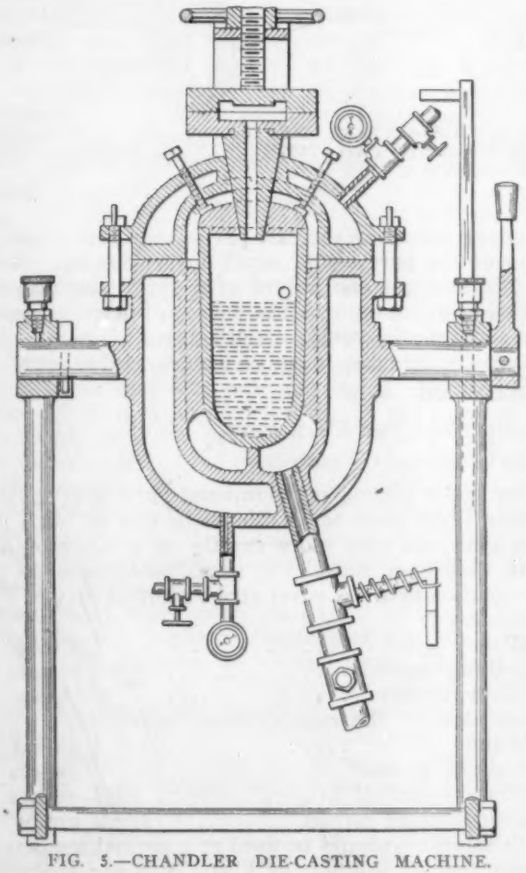


FIG. 5.—CHANDLER DIE-CASTING MACHINE.

be die-cast in a metallic mold around a metallic core. As the molten metal strikes the mold it solidifies. Here a change of state occurs that is accompanied by a reduction in volume, commonly termed shrinkage. Unlike a sand core, the metallic core is not compressible and retains its original size and form so that the shrinkage of the metal is converted into a stretching action on the solidified casting. If the elongation of the alloy at that temperature is not high enough to withstand this stress the casting will crack. In the usual die-casting practice it is not practical to remove the casting from the die at the solidification temperature of the alloy. For example, the solidification temperature of the aluminum-copper alloys used in the die-casting process is approximately 1150° F. (621° C.) It has not been found practical to run the casting dies above a temperature of 500° F. (260° C.), which means that the castings are withdrawn from the dies at that temperature. It follows that the casting is subjected to another stretching stress after the casting has solidified and that is due to the contraction in volume that must occur when a casting is cooled from a temperature of 1150° F. to 500° F.

The writer has been unable to find any reliable method for determining quantitatively the elongation of alloys at various temperatures. Many methods have been suggested but they have proved of doubtful alue. The simplest way is to use the old "try-and-see" method. To test the alloy, a casting is made in a die having a comparatively large core and thin wall. If the alloy can stand the casting stress, a perfect casting will be obtained, otherwise the casting will show bad cracks. Only a comparative result is obtained, but for everyday control it answers the purpose. However, a simple and reliable method for determining quantitatively the elongation of metals and alloys at various temperatures.
would prove of enormous value to all metallurgists engaged in the various phases of metal-casting research.

It is interesting to note that the elongation of a metal or alloy at normal temperatures is no indication as to the properties of that metal or alloy at higher temperatures. The writer has found many cases where an alloy showing little or no elongation at normal temperatures shows a high elongation at higher temperatures. The alloys of aluminum and copper may serve to illustrate this point.

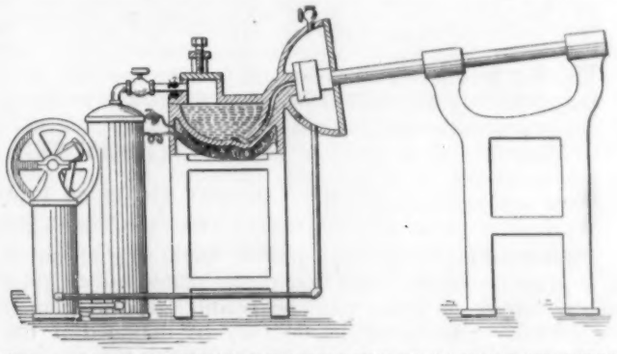


FIG. 6.—MACHINE WITH DIE ENCLOSED IN VACUUM CHAMBER.

It is well known that the addition of copper to aluminum reduces the elongation of the aluminum alloy. An aluminum alloy containing 12 per cent copper will show less elongation than an alloy containing only 6 per cent copper when tested at normal temperatures. Nevertheless, the 12 per cent copper alloy has a greater elongation at higher temperatures than the 6 per cent alloy and consequently the 12 per cent alloy is better able to withstand the casting stresses to which it is subjected in the die-casting process.

In the early days of the die-casting industry, alloys were compounded indiscriminately and little or no consideration was given to the metallurgical principles involved. The manufacturer in many instances knew much more about machinery than about metals. The result was that there were put on the market die castings made from alloys that deteriorated rapidly and created a prejudice among engineers against the use of these castings. That this prejudice was in part justified must be admitted: nevertheless, the modern die-casting plant is equipped with physical and chemical testing laboratories and the die-casting practice of today bears no relation to that of 5 years ago.

DIE CASTINGS MADE FOR WAR PURPOSES.

Die castings have had their most severe test during the past 2 years, during which time most of the die castings manufactured were used directly, or indirectly, in the Government's war program. Here is a partial list of the application of die castings for this purpose.

Gas masks, breather tubes and other metal parts.

Lewis machine guns, 100 die-cast parts to every gun.

Browning machine guns, four of the most vital parts.

Naval and army binoculars, the entire housing.

Army trucks, tanks and airplanes die-cast parts include parts of ignition system, carburetor, gasoline regulating devices, steering-wheel accessories, ball-bearing cages, bearings, speed indicators, etc.

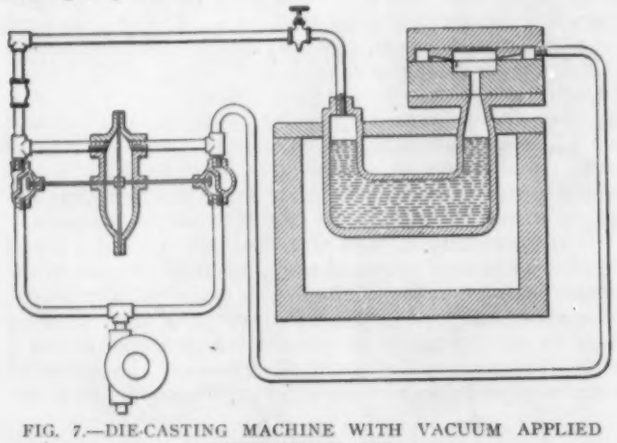


FIG. 7.—DIE-CASTING MACHINE WITH VACUUM APPLIED DIRECTLY TO DIE.

Pistol, complete signal pistol.

Submersible bombs, some designs contained as many as 10 die-cast parts. Hand and rifle grenades, every grenade manufactured in this country contained one or more die castings.

Trench mortar shells, plugs die cast.

Airplane drop bombs, one or more die cast parts.

Surgical instruments, including hair clippers, respiratory devices, etc.

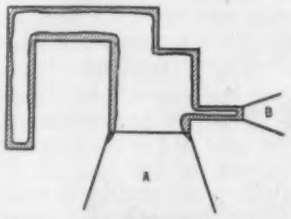


FIG. 8.—CROSS-SECTION OF CASTING WITH TWO GATING POSITIONS.

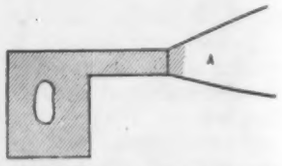


FIG. 9.—DIE CASTING SHOWING SHRINKAGE-HOLE.

In many instances, die-cast parts were used where the failure of the part would result in serious loss of life. The fact that not one failure of a die casting has been reported must continue to be a source of deep satisfaction to the modern die-casting manufacturer.

GILDING ALUMINUM

SOME VALUABLE HINTS AS TO HOW TO PERFORM THE OPERATION.

WRITTEN FOR THE METAL INDUSTRY BY CHARLES H. PROCTOR.

Aluminum is a somewhat difficult metal to gild, but if it is properly cleaned and first nickel plated either gold, silver, copper or brass may be readily deposited upon the nickel. Successful results may be obtained if the directions given below are followed: Polish the parts in the usual manner, then free from excess of polishing material by using benzine or gasoline and then dry the articles in maple sawdust. Then clean in a mild hot cleaning solution made up from the following formula:

Water	1 gallon (200° Fahr.)
Tri-sodium phosphate	4 ounces
Soda ash, 58 per cent	4 ounces

Immerse the articles in the cleaner for a few moments, then remove wash thoroughly in cold water and immerse in the passive dip for a few seconds.

Nitric acid, 38 per cent	½ gallon
Sulphuric acid, 66 per cent	½ gallon
Chloride of iron crystals	2 ounces
Water	¼ pint

Mix the two acids together, then dissolve the iron crystals in the one-quarter pint of hot water and mix thoroughly with the acids. When using the passive dip always keep it well stirred, as the iron does not combine with the acids. After immersing the cleaned aluminum in the passive dip remove and wash in cold water, then plate direct in the nickel solution until a uniform coating is obtained. If the nickel coating is to be afterward polished the aluminum should be given about a twenty-minute deposit. The following formula is recommended for the nickel solution:

Water	1 gallon
Single nickel salts	12 ounces
Sodium citrate	4 ounces
Magnesium sulphate	1 ounce

Use cast-nickel anodes and a voltage of from 2 to 2½, and after the nickel has been deposited uniformly reduce the current to the point where burning is eliminated.

After nickel plating the aluminum parts it is advisable to either silver plate for a minute or two or brass plate as the gold will take more readily on a silver or brass deposit than upon nickel. It is advisable to strike in a silver solution first. A silver strike solution may be made up as follows:

Water	1 gallon
Sodium cyanide	6 ounces
Silver cyanide	½ ounce

Then plate in the regular silver solution.

Water	1 gallon
Sodium cyanide	3 ounces
Silver cyanide	2½ ounces
Bisulphide of carbon	2 grains

Both solutions should be used at a normal temperature and the regular solution at 1 volt and the strike at 2 to 2½ volts.

The gold plating or gilding solution should be prepared as follows:

Water	1 gallon
Sodium cyanide	⅛ ounce
Gold Trisalyt	1/3 ounce
Phosphate of soda	¼ ounce

Use the solution at a temperature of 160 to 180 degrees Fahr. and at 2 volts.—C. H. P.

CURRENT REQUIREMENT FOR VARIOUS DEPOSITS.

	Amperes per square foot.
Brass	4.3 to 5
Copper, typing, good solid deposit	14.4 to 36
Copper cyanide	2.9 to 4.3
Gold	.71 to 1.44
Silver	1.4 to 4.3
Nickel, begin with 9 to 10 amperes per 100 square inches, diminishing to	1.4 to 2.9
Zinc	10 to 20

If solutions are agitated, the current density can be doubled and in some cases trebled.

RUST-PROOFING OF IRON AND STEEL

A Description of the Parker Rust-Proof Process

Written for The Metal Industry by Elmer S. Whittier

The Parker rust-proofing process has only very recently come into general use as a method of protecting iron and steel articles from atmospheric corrosion. Although several processes based on the same principles as the Parker process have been used, there were none which could be called standardized in reference to uniformity of action. Certain concerns had worked out a method with these principles for their own particular products, but it remained for the licensors of the Parker process, who had obtained control of the different patents of Coslett, Richards and others to make up concentrated solutions of the necessary chemicals, and standardize apparatus and methods to such a degree, that in a comparatively short time, the process can be installed and in a working condition without extended experimentation. This does not mean, however, that the process is at an advanced stage of development, for as the writer will indicate in a later part of this article, there are certain phases which need some improvement. Probably some of these points have been cleared up at individual installations of the process, but they are not generally known. It seems that any advance in the art of both coloring and rust-proofing metals, such as this process represents, should be open to the most frank and searching discussion. This article will take up in turn a short history of the process, its theory, its use as a rust preventative and as a substitute for the various methods of producing a black color upon steel; comparative tests carried out by the writer; a discussion of preliminary treatment of articles to be processed and some notes of criticism which it is hoped will point out lines along which research work may be done to make improvements.

The principles upon which the Parker process is based were contained in a process introduced into the United States in 1907, known as Coslettizing. Thomas W. Coslett, a chemist of Birmingham, England, discovered the process as the result of experiments on the protection of iron and steel from atmospheric corrosion. Coslett's method consisted in dipping work to be rust-proofed in a boiling, weak solution of phosphoric acid with iron filings in the solution. This produced on the surface of the articles a protective coating of iron phosphates. The exact constitution of this coating does not seem to have been agreed upon. It is mentioned in various sources as "a mixture of ferric and ferrous phosphates," "a phosphatic layer" and "a basic phosphate." It would be interesting to have the exact constitution of this layer explained. This may have been done, although the writer has seen nothing definite in the literature published concerning the process. In 1913 Richards patented the use of phosphoric acid in conjunction with manganese dioxide. Professor W. H. Allen in 1916, 1917 and 1918, discovered the use of the acid phosphates of calcium and manganese and also the use of the bath of ferric acid phosphate. Oeschger, in 1917, discovered the treating of iron with the vapors of meta phosphoric acid. Allen discovered the use of phosphoric pentoxide and steam for vapor treatment. The latter processes have not been introduced into commercial production and are still in an early stage of development. Allen later discovered that a dip into a weak solution of ferro or ferri cyanides after processing converted any soluble adherent phosphates into insoluble ferro cyanides of iron, thereby adding to the value of the process. It will be seen that all these inventions deal with producing an insoluble phosphate upon steel and iron surfaces. The endeavor now is to make the bath more uniform in performance.

The Parker process, as now used, consists in immersing iron or steel articles, which have received proper cleaning treatment, in a weak solution of acid iron phosphates at a temperature of 205—210° F. and leaving them in the solution until chemical equilibrium has been established between the iron, the phosphate coating and the solution. After the removal of the articles from the processing tank, they are rinsed, dried and then oiled with a heavy or light mineral oil, as is desired. The licensors of the process furnish specially designed tanks, and, although, one can build his own tanks, it will generally be cheaper in the end to get the made up process tanks, as they represent construction which is designed to do away with certain causes of poor rust-proofing. To be sure, the article to be processed may be of a design that will necessitate a specially constructed tank, but before wasteful expenditures are made on tanks which may cause a lot of trouble, consultations should be made with the process engineers. For laboratory work on processing, cast or wrought iron pots of about two gallons capacity are the best to use. Glass is not desirable on account of the tendency of solutions to bump in the presence of the undissolved material. Granite ware or aluminum vessels should not be used. The standard process tanks which are furnished by the licensors have several peculiar points of construction. The steam coil for heating the solution was formerly placed at the bottom of the tank, but it was found that if the coil was placed at the side instead of the bottom, the sediment and excess chemicals which settle to the bottom would not be stirred up so violently and be a source of trouble in processing. This placing of the coil at the side sets up a rolling motion of the solution which is a big aid to the interreaction of the chemicals and the processing. False bottoms which are hinged to the rear of the tank, enable the operator to clean out the sediment coming from the process. In setting up a tank, care should be taken in having a sufficient supply of steam to keep the solution at the required temperature. It is economy to have a steam trap attached to the outlet of the coil. The steam trap should discharge into the rinse, thus providing heat for the latter. The tanks are provided on all sides with air chambers which conserve the heat and make working conditions around the tank pleasanter. A galvanized iron hood should be built over the top of the tank, with proper means of exhaustion, so that when opening the tank for unloading and loading, the steam will be carried off. On heavy individual pieces, or work which is packed in a basket, a chain hoist is sometimes necessary, and if so, a track and trolley should be provided. The tanks do not have to be placed in the plating room. They can be anywhere in the factory on the schedule of operations where the least trucking will have to be done. The floor of the room where the process is installed should be properly water-proofed and drained. Preliminary experiments will show what cleaning treatment is necessary. If electro-cleaning is decided upon, it would be best to have the process near or in a plating room, so as to be near to the electric current for plating. If the work processed is to be racked, only steel should be used in constructing the racks. The writer has attempted to use racks made of other metals, and has encountered difficulties caused by galvanic action. When using brass racks, the brass would deposit on the work and prevent

processing taking place. It might be well to state at this point that the Parker process does not blacken any other common metal except iron and steel. Many, not familiar with the details of the process, seem to think that it can be applied to any metal in the same manner as nickel or silver plating.

BUILDING UP THE SOLUTION

With the tanks and other necessary equipment installed, there comes the question of the initial charge, or, as is more commonly stated, building up the tank. Taking, for example, a 500-gallon tank, after inspection for leaks, the tank is nearly filled with water which is brought to the boiling point. To this are added approximately 50 pints of Hyro Acid Compound and 25 pounds of Solite. This is added in small portions at a time as is convenient. In this way the chemicals become well dissolved. After the last charge, the tank should boil or roll (the boiling of the solution next to the coils causes a rolling movement of the water toward the front of the tank) for a least one hour. The tank is then tested. Ten cubic centimeters of the solution are withdrawn with a 10 cc. pipette and poured into a 300 cc. Erlenmeyer flask or any convenient glass receptacle such as a jelly jar or tumbler. To this are added 50 ccs. distilled water and a few drops of phenolphtalein solution. Then N/10 sodium hydroxide is run in from a burette until a pink tinge is shown by the solution. If the number of ccs. sodium hydroxide solution is below 14.5, Hyro Acid Compound and Solite are added in the ratio of 2 pints acid to one of Solite until 14.5 is reached. By observing the quantity of chemicals necessary to raise the tank strength one cc. N/10 sodium hydroxide, the tank factor is obtained. For example, if it were found that to raise the tank strength from 12.5 ccs. to 14.5 ccs. N/10 sodium hydroxide, 4 pints of Hyro Acid Compound and two pounds of Solite were necessary, then the tank factor is 2 pints of Hyro Acid Compound and one pound of Solite. For testing equipment there should be provided a small table with a porcelain or opal glass top, if possible. An ordinary wooden table with the top painted white is very good for titrating the processing solution. There will be needed a burette, reading to 1/10 ccs. a stock solution of N/10 sodium hydroxide, an alcoholic solution of the indicator phenolphtalein, a glass stirring rod, a 10 ccs. pipette, a 350 ccs. Erlenmeyer flask and a jar of distilled water. For handling the acid, there should be provided a stone-ware jug with pint division marks on the inside. For weighing out the Solite an ordinary household scale is satisfactory. The test solutions can be obtained already made up and standardized, but where the laboratory equipment is available, they can be made according to the following directions:

N/10 SODIUM HYDROXIDE SOLUTION

Dissolve 4.1 grams of chemically pure sodium hydroxide in 300 ccs. of distilled water in a 1,000 cc. volumetric flask. Allow to cool to the room temperature and dilute to 1,000 ccs. with distilled water. Add water to the solution until 50 ccs. of it are exactly neutralized by 50 ccs. of N/10 sulphuric acid, using phenolphtalein as an indicator.

PHENOLPHTALEIN INDICATOR

Dissolve .35 grams phenolphtalein in 65 ccs. grain alcohol. After solution, make up to approximately 100 ccs. with distilled water.

PROCESSING

When the tank is first started up it will be found necessary to continue the boiling or rolling action for some time until the chemicals are dissolved. The sediment on the bottom of the tank should be stirred from time to time, so as to insure a complete reaction between the process chemicals. When the sediment shows a greenish tinge, it indicates that the reaction is complete. After one has worked for some time with the solution he comes to recognize the light green color and characteristic odor presented by a solution which is well balanced. When a solution stands idle for several days, it becomes milky looking and must be rolled for a few hours before it can be used again.

All material to be processed must be clean and free from dirt and grease. Avoid touching with the hands any surface which is to be processed. The finish of the article after processing will depend entirely upon the preliminary treatment when the tank is working right. Machined surfaces of soft steel should be cleaned either with gasoline or some cleaner having a saponifying action. Sometimes a roll in sawdust will be sufficient. In the writer's experience, he finds that the emulsifying cleaners do not work well on articles which are to be processed. The steel articles will react with the process chemicals and hydrogen bubbles rise from the solution. When this bubbling ceases, the articles are taken from the solution and are rinsed. They will be found to be covered with a dark gray deposit which is darkened to a jet black with a heavy oil called Baltic oil, or is made slightly darker with a light oil called Parkerol. Sometimes work will be discovered streaked with a line or band which is slightly more brilliant than the remainder of the surface. This usually can be traced back to a neglecting of the rinsing operation. If the work should come out of the solution with a starry, spangled appearance, the first thing to do is to see that the tank solution is properly balanced by testing for acid strength. Then, after building up to the required strength, roll the solution until it works properly. Sometimes there will be a slight matte appearance to the finish, and if the work is to be japanned or painted, this is an advantage, as it offers a good adherent surface for the paint. When a very fine surface is desired the different sand treatments should be tried. Sand blasting is very generally used and is comparatively cheap. For small articles a roll in dry sand puts the surface in an excellent condition for processing. Small articles can be processed in a round, perforated steel or wooden drum which is placed in the solution so that it can be given a ¼ turn every five minutes. The most even surfaces result from some form of sand rubbing, either by hand, a wheel or tumbling. The sand seems to remove something which all other cleaning operations leave. Forgings, in spite of all cleaning treatments will sometimes cause trouble, but this can be traced back to scale spots which have not been removed by machining. The only remedy for this is to machine or grind deeper so as to remove these spots. Hot rolled steel stampings are generally sand blasted. Hardened surfaces which are highly polished present some difficult problems. Sand-blasting does not have the effect that it would have on a softer steel, and it is not to be recommended for such surfaces. The surfaces have been so highly polished that the pores of the metal are rolled over and offer a very poor surface for the process to react on in the proper manner. The sand rub is the solution for a problem of this kind. The preliminary cleaning should, of course, be given the steel and in this case the use of the electric cleaner is recommended. For general work, a pickle containing 4—5 per cent sulphuric acid and a trace of sodium bisulphite at a temperature of 160—180° F. has been used with success. After pickling, the articles should be rinsed well, as the processing bath will have to be thrown away and renewed if contaminated with any of the common pickling acids. Good results are obtained by an additional rinse in borax or sodium phosphate solu-

tions. For laboratory work scouring with sand, to which a slight amount of sulphuric acid has been added is good.

Much care must be taking in racking to see that hollow spots in the articles are not placed in the solution so that hydrogen pockets will be formed with the result of having unprocessed spots where the pocket of hydrogen gas existed. Work which has flat surfaces should be racked so that no two flat surfaces touch. Small round articles such as bolts, nuts, pins, etc., can be processed in a basket. Steel parts which have been fitted with some brass part should not be processed after being assembled. The different parts should have their finishes applied first and then be joined. Where a non-ferrous metal is joined to steel or iron, the galvanic action set up is liable to weaken the joint. This does not apply in all cases, but it is a point to be considered carefully. Where brass is present it seems to be carried over onto the steel, with the result of unprocessed spots. Hollow tubes should be placed horizontally in the tank, pointing to the back so that the rolling motion of the solution will give a current through the tube. Where a large quantity of small work is to be done, a continuous process can be carried out. Arrangements would have to be made to stop the machine periodically for building up the tank strength. When the processed parts are taken from the solution and rinsed in hot water, the color will vary from a gray to an almost jet black. This color varies with the nature of the surface. A hardened surface gives a gray color; a machined surface a darker gray, while a sand-blasted surface is black. The oil which is applied as a part of the process develops the darker shades. Two oils are used, the trade names being Parkerol and Baltic Oil. The former is a light oil and can be sprayed on or used for dipping. Baltic oil is a heavy black oil and is to be applied by hand or with a wheel.

Baltic oil is used where a smooth black finish is desired. The Parker finish has supplied the demand for a substitute for the Browning process, which, as indicated by the writer in a previous article, is a very unreliable method, consisting of many operations and consuming much time. The Browning process does give a very brilliant black finish, but it can be duplicated by the Parker if the proper preliminary treatment is given and if the Baltic oil is applied after processing. The sand rub treatment gives the smoothest surfaces and most even blacks. If processed parts are to be assembled with other parts they should be kept separate with compartment trays, or by paper between layers and after final assembly should be wiped up with a cloth having a small quantity of Baltic oil on it. Articles which have hardened only in a certain section will show after processing a line between the hardened and unhardened parts. This is caused by the difference in shades of the finish on the hardened and unhardened surfaces. After a rub with Baltic oil this line disappears. If paint is to be applied to the processed parts the writer has found that good results are obtained by heating the parts to about 300° F. and then washing with thinner. If work is left in the solution after the time necessary for the completion of the reaction, no harm will be done as long as the solution is in good balance. The writer has taken material from tanks after it had been lying in the tanks for three months. After rinsing and oiling, the articles were as good as those done in the regular way.

A tank which is out of balance will give uneven and very starry deposits. It sometimes takes a lot of rolling to get a tank back into shape again. The Solite or manganese dioxide must be very finely pulverized. If it is very gritty, or has much coarse material in it, trouble will be encountered, as it is difficult for the Solite to react with the low acidity of the solution. The writer suggests that some mesh of manganese dioxide be adopted as a standard so as to have a more uniform reaction in the solution. It also seems desirable to have one other test besides the sodium hydroxide test; something which would indicate the state of the solution caused by continuous rolling which is necessary when the solution gets out of balance.

RUST-PROOFING TESTS

When methods are being considered for either rust proofing, or giving an article a black coating, there arises the question as to the relative resistance to corrosion of the coatings given by the different methods. Certain accelerated corrosion tests have been developed for galvanized, sherardized and electro-galvanized material. One is known as the Preece test, but it is not suitable for a finish like the Parker process finish. Another method coming into use is the salt spray test. This consists of a box of special design, provided with holders for the samples to be tested. At the bottom of the box is a solution of table salt whose gravity is between 1,026 and 1.03 a 60° F. This solution is connected with an atomizer which blows a fine mist into the box, depositing a thin film of salt water upon the work. A detailed drawing of the salt spray testing box is given in Bulletin No. 48926 of the General Electric Company. This method gives good comparative results when used with other methods. A third method is as follows: A glass jar is filled with distilled water and a glass tube drawn to a small opening is placed into the jar. Air under pressure goes through this tube and bubbles up through the water.

The articles to be tested are placed in the path of the bubbles. The writer regards this test as better suited to oxide and phosphate coatings than the salt spray test, although he uses both tests and others in investigating such coatings.

Where time permits, the best test is the exposure to the actual conditions that the article will meet while in use. There are certain other severe tests from which much valuable information can be obtained. In some comparative tests made recently on the Parker process and two other oxidizing processes, the water and air and the salt spray tests were used. In addition to these, five tests in different atmospheres found around a factory were used, so as to check up, if possible, the results of the other tests. The time on all of these tests was 72 hours.

Test A: The samples were exposed on the walls of a small room, in which steel articles were cleaned in an alkaline bath. The two oxidized finishes were badly corroded. The Parker finish was not affected.

Test B: The samples were exposed to the outside atmosphere during very stormy weather in the winter. One oxidized finish was slightly rusted. The second oxidized finish was not affected. The Parker finish was not affected.

Test C: The samples were exposed on the walls of a small room in which acid dipping was done. The first oxidized finish was badly corroded. The second oxidized finish was slightly corroded. The Parker finish was not affected.

Test D: The samples were immersed in city water for 7 hours. The two oxidized finishes were slightly corroded. The Parker finish was not affected.

Test E: The samples were exposed in the hood of the chemical laboratory. There were present the fumes of sulphuric, muriatic and nitric acids. The two oxidized finishes were badly corroded. The Parker finish was slightly corroded. This last test was considered too

severe, and was not used again. All these tests agree with the salt spray and the water and air tests. The final test, however, is the behavior in service.

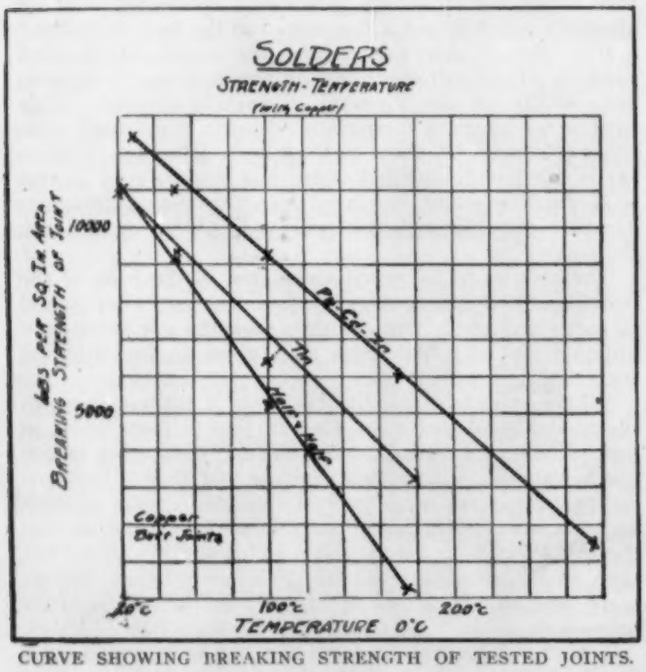
When the surface is to be painted, the resistance to corrosion of the Parker finish will do away with any extra coats of paint. All that is needed is enough for the color.

In considering the Parker process as a substitute for galvanizing, sherardizing or electro-galvanizing, the service conditions should be studied carefully. Where the articles are to get severe wear, the Parker process is not the equal of the zinc coatings, as one cannot expect a chemical coating to wear as well as a metallic one.

STRENGTH OF SOLDERS AT ELEVATED TEMPERATURES.

WRITTEN FOR THE METAL INDUSTRY BY C. W. HILL* AND C. H. CARPENTER.*

The strength of a soldered joint decreases with increasing temperature, as is well known. The following experiments and resulting data may be of interest to those using solders under conditions of elevated temperatures. There are many such conditions in commercial work, as for example automobile radiators, tin and copper boilers and drying ovens, certain types of electrical machinery, etc. It is somewhat surprising to find that the effect of temperature begins to make itself apparent at rather low temperatures, which fact accounts for the failure of soldered joints at temperatures considerably below the melting point of the solder.



CURVE SHOWING BREAKING STRENGTH OF TESTED JOINTS.

DESCRIPTION OF EXPERIMENTS.

In a previous article,† tests were given on commercial solders using various types of soldered joints. While these figures are representative of the strength of such joints at elevated temperatures, and are of value in connection with such joints, the tests cannot be considered rigorous as a measure of solder strength on account of the elongation of the copper test piece under load. It would seem that a butt joint would give a better test of the active strength of the solder. It should be noted that a pulling test on a bar of solder does not bring into consideration the alloying of the solder with the metals which are to be united, and therefore is not a practical test. In testing a large number of solders it is found that some soldered joints pull apart at one of the faces wet by the solder, while the solder between the united metals is much stronger. With other solders the joint seems to be stronger at the soldered faces than in the body of the soldered union. This is undoubtedly due to a change in composition of the solder by alloying with the metal to be soldered.

It is seen that the strength of a soldered joint is related to the strength of the alloy formed at the face of the metal to be soldered as well as the strength of the intermediate unchanged solder. When sufficiently thin sections of solder are used there can be no region of unchanged solder. The strength of a soldered joint will therefore be different with varying thicknesses of solder layer.

The joints which were to be tested at different temperatures were ½-inch diameter copper cylinders, soldered end to end, each being fluxed and "tinned" with the solder before uniting. The thickness of the solder layer between the two copper cylinders was .005 inch. The flux was a solution of metallic chlorides, largely zinc and ammonium chloride. Tests were made with the solder layer .05 inch in thickness. The actual breaking strength of such joints were not materially different from those given by the curves, while the comparative strength of the different solders was the same.

The joint was pulled apart in an Olson testing machine, the copper cylinders being surrounded by a suitable electric resistance furnace. The temperature was measured by a thermo-couple of copper-adronce wire, the couple either being clamped to the side of the copper cylinders near the union or inserted in a small hole drilled in one of the cylinders ⅛ inch from the union. The temperature of the furnace was increased slowly to the desired point—thus avoiding overheating the joint.

RESULTS.

The attached curve gives the breaking strength of the joints made and tested as above. Each point is the average of five separate tests. The solders tested were (1) Half and Half, (2) pure Tin, and (3) a special solder of Lead 90.6 per cent, Cadmium 7.9 per cent, and Zinc 1.5 per cent.

To any one who has worked with solders it is unnecessary to call attention to the fact that such curves are only indicative of the effect of heat on the strength of the soldered joint and are not to be considered as absolute values. There are so many variables connected with even so simple a test as the one outlined that there is likely to be considerable variation among samples of the same composition. This is due to the difference in temperature of the soldered pieces (affecting the extent of the alloying action) and rate of cooling of the soldered joint. The results obtained with different lots of solder show considerable variation. On account of these variations in a practical way it is unwise to attempt elaborate tests. It is quite probable that the curves are not straight lines as indicated, but there would be no object in determining this point.

*Research Laboratories, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

†THE METAL INDUSTRY, Vol. 16, p. 412, 1918.

EDITORIAL

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THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER AND BRASS, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS' REVIEW.
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CONTENTS

MAGNESIUM

As is shown in the letter published on the following page of this issue the metal magnesium is again obtainable for use in foundry practice. The intense demand for the metal created by the war caused the price to soar to around four or five dollars a pound and put it quite out of the reach of the (poor?) metal melter. However, the cutting off of the supply from Germany caused the erection of producing plants in the United States so that at the present time there are several concerns prepared to turn out magnesium at a fair price.

Magnesium has long been known for its valuable properties as a deoxidizer aside from its other uses. It is a white silvery metal with a specific gravity of 1.7. It is ductile and malleable and on heating may be drawn into wire and thin ribbon. It melts at from 700 to 800 degrees Centigrade and distils at a white heat. When finely divided as in powder and projected into a gas flame it burns with an extremely luminous light which property is taken advantage of in the manufacture of photographic flash lights.

Magnesium does not alter in appearance in dry air and is resistant to the action of alkalies and is easily dissolved by dilute acids with the evolution of hydrogen. It reduces many oxides liberating the corresponding metals and non-metals such as copper, nickel, boron, carbon and silicon, etc. It combines under certain conditions with other metals to form alloys some of which are particularly useful. There is one now in use called MAGNALIUM which consists of from 10 to 20 per cent of magnesium and from 80 to 90 per cent of aluminum which has a fairly wide application in automobile and airplane construction.

The preparation of magnesium alloys is attended with great difficulty owing to the ready oxization of the metal. The alloys may be obtained by melting the metals together in a current of hydrogen, or under fluxes of fluor spar and common salt or cryolite or as Mr. FALCONER states, "the constituent metal or metals may be melted and the magnesium quickly immersed by means of tongs, but the surface should be well covered to avoid loss."

According to Parkinson, magnesium furnishes alloys with sodium, mercury, tin, cadmium, bismuth, lead, zinc, antimony, silver, platinum, gold, copper and aluminum; it alloys also with copper and nickel when combined, but not with iron, cobalt or nickel. This property is probably one of the reasons as told by Mr. HUTCHINSON in his letter on page 84 of this issue, why he finds it valuable for use in cupro-nickel, and also in nickel-silver when the latter is made from impure materials.

The color of the white metals combined with magnesium is not essentially affected, except where the content of magnesium is very large, as in certain alloys with tin, silver and lead. All magnesium alloys are, however,

very brittle, tarnish more or less in the air and decompose water more or less readily. Consequently the use of magnesium in the foundry should be conducted with care and provisions should be made for intelligent handling. Copper, brass and bronze are not rendered malleable and softer by the addition of magnesium, but are rendered brittle so no more should be used than is necessary for the reduction of oxides known to be present. This, as Mr. FALCONER implies, is a metallurgist's job.

AMERICAN INSTITUTE OF MINING ENGINEERS

The American Institute of Metals, now known as the Institute of Metals Division of the American Institute of Mining Engineers, will hold its first New York meeting, February 17 to 20. As is outlined in Chairman Corse's announcement in this issue of THE METAL INDUSTRY the program arranged for promises to be very interesting and valuable to foundrymen at large.

Two of the papers to be presented at this meeting are published in this issue of THE METAL INDUSTRY., "DIE CASTINGS AND THEIR APPLICATION TO THE WAR PROGRAM," by Charles Pack, is especially significant in that it gives a good idea of the important place now held by die castings in the metal field. The other paper on "MANGANESE BRONZE," by P. E. McKinney is noteworthy because of the author's clear cut description of his experiences in making the metal in a reverberatory furnace. His statement that "There is no necessity for the use of high grade raw materials provided methods of manufacture can be devised to produce the proper refinement of the furnished product" is particularly interesting as it substantiates the statements made by W. R. Dean in an article on "MANGANESE BRONZE," published in THE METAL INDUSTRY, January and February, 1911, and again in one on "MANGANESE BRONZE PROPELLER WHEELS," published in the February, 1913, issue. Another paper that should arouse considerable interest is "STANDARDS FOR BRASS AND BRONZE FOUNDRIES AND METAL FINISHING PROCESSES," by Lillian Erskine. This paper is a valuable contribution to the work now going on for the conservation of health of the metal worker.

The reading and discussion of these papers, together with the social features planned should go far to help Chairman Corse realize his desire for a large attendance. The Institute of Metals day is February 17 and should be kept in mind by all who are interested in metals and whose duties would limit them to attendance of one day only.

AMERICAN ELECTRO-PLATERS' SOCIETY

As is told in the announcement on another page of this issue of THE METAL INDUSTRY the New York branch of the society will hold their tenth annual banquet at the Broadway Central Hotel on Saturday, February 22.

This will be a Victory banquet and the banner afternoon and night for platers in this section, and the day—a holiday—has been deliberately chosen with the idea in view of getting out a large number of members and their friends interested in the art of electrodeposition and finishing of metals.

The committee of arrangements and reception will be on hand early in the afternoon to make those coming from out of town feel at home and to introduce them to members of the New York branch with whom they are not already acquainted. It is announced that there will be only one speaker, Dr. M. C. Burt, director of research and experimental laboratories of the Atlas Powder Company at Wilmington, Del. Not much has been said about entertainment outside of Dr. Burt's address, but any one acquainted with the personnel of the entertainment committee need have no fear but that this has been well taken care of and some startling features may be looked for.

CORRESPONDENCE AND DISCUSSION

While we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

MAGNESIUM AND NICKEL-SILVER

TO THE EDITOR OF THE METAL INDUSTRY:

I have read with interest an article on page 13 of your January issue on "Casting Nickel Silver, a Copper Nickel-Zinc-Alloy."

In this article there is no mention made of using a deoxidizing agent in order to assist in obtaining good castings, but deoxidizing agents are frequently used for this work. For a number of years magnesium has been used in nickel and monel metal castings, and a great many foundrymen are finding its use especially valuable in casting copper-nickel-zinc alloys.

In this work it is used in the proportion of about .05% to .1%, and it is very effective in eliminating blow holes and porosity in the castings. Another feature is that the tensile strength is increased, some foundrymen reporting as high as 30% average increase.

In order to introduce the magnesium it is held in iron tongs and plunged to the bottom of the crucible. There is no violent action, and the magnesium melts quickly so that no trouble need be experienced in clogging of the tongs. The magnesium is introduced after the molten metal has been removed from the fire, and the magnesium should be well stirred into the molten metal in order to insure a uniform mixture. The metal is then skimmed and poured in the usual way.

The regular use of magnesium will be found to result in a very marked reduction in the number of lost castings, and since 1 pound of magnesium will deoxidize from 1,000 to 2,000 pounds of nickel-silver, its use is not only very cheap, but very economical.

D. P. FALCONER,
Sales Agent, Shawinigan Electro-Metals Company.
Cleveland, Ohio, January 29, 1919.

TO THE EDITOR OF THE METAL INDUSTRY:

In answer to your letter of January 30th, I wish to say that I have not found it necessary to use a deoxidizing agent for nickel-silver when virgin metal is used. However, an ounce of magnesium to every one hundred pounds of metal can do no harm. When a remelt is made I would say it is good practice to use this per cent, or four or five ounces of manganese. Magnesium is a very good deoxidizer and, in addition, helps considerably in reducing oxides. Manganese is also a good deoxidizer, and when a very strong casting is desired, it helps in this respect a good deal. If it is used strictly as a deoxidizer, pure manganese is best, but if wanted for an alloying purpose, it should be used in the form of cupro-manganese, inasmuch as the pure does not alloy readily with zinc.

Some foundrymen, brass as well as nickel-silver, are troubled with porous castings because their molds are not vented properly.

and sometimes because the sand is too wet, or rammed too hard. I would say, though, that magnesium can do no harm, and can often times do very much good.

Zinc, as you say, can to a certain extent act as a deoxidizer. Sometimes, however, it volatilizes and in this way exposes the metal and may lead to danger. Cupro-nickel, on the other hand, lays very quiet and if coveerd with charcoal should not cause trouble in melting. Cupro-nickel chills quicker than nickel silver and consequently gases have a harder time getting to the surface. Venting, if anything, is more important in the former than in the other. R. V. HUTCHINSON.

AUBURN, Ind., February 3, 1919.

BELGIUM APPRECIATION

TO THE EDITOR OF THE METAL INDUSTRY:

The war has interrupted the sending of your esteemed trade journal.

Will you kindly send me all the numbers issued from October, 1914, till now in order to complete my collection? At the same time give me the amount of the bill and immediately I shall send you a post check to cover it.

With my best compliments and many thanks for the aid the valiant American people have given us Belgians to recover our liberty. CL. PEETERS.

Bruxelles, Belgium, November 11, 1918.

[It is to be noted that our Belgian friend lost no time in his wish to continue his study of THE METAL INDUSTRY as he dated his letter the day the armistice was signed.—Ed.]

ECHOES OF THE WAR

Writing from France, **Lieutenant G. Lamonte Hammann,** of the aviation service, son of George E. Hammann, secretary and treasurer of the Progressive Manufacturing Company, Torrington, Conn., relates the following exciting experience:

"One day while on reconnaissance at Chateau-Thierry I ran into a patrol of seven Fokkers, and they immediately tried to make a sieve out of our plane. Finally, one bullet cut off our elevator control wire and we came down out of control and crashed south of Fismes. Fortunately, however, I was not scratched, but the boy with me was killed. He landed on his head and broke his neck. Two weeks ago today a similar thing happened. While adjusting a battery of 240 mm. howitzers on a German dump I saw a German plane attack one of our balloons and drive it down, so just for the deviltry of the thing we started for the Boche, who proceeded to empty his machine guns into our motor, and we did the same thing in return, plus two extra guns. The first thing I knew the old motor started to cough and then finally stopped; consequently we were forced to land, and did so in a trench which turned us over and smashed the plane all to ———. Again I was bruised, but not enough to stop me from walking seven kilometers to the nearest station."

Lieutenant Hammann, just prior to the signing of the armistice. was made a staff officer for the chief of air service. 1st army corps.

To the Editor of THE METAL INDUSTRY:

I have your very kind letter of October 30 and note your request that I write you of some of my experiences with the American Expeditionary Forces.

It is rather arduous to write of the events that have been connected with we boys in this war as they have been so numerous and varied, but I hope the incident about which I write will be of interest to your readers.

The most nerve racking ordeal I think, or at least the one that seems to remain fresh in my mind, was caused by the new arm of service, the aeroplane, with the destructive machine-gun mounted on it.

The incident occurred on the third day of the big American drive of September 26 on a steep hill beyond those dense woods known as the Argonne Forest.

Our machine-gun company was advancing to a more advantageous position where we could mount our guns to meet a counter attack that the "Huns," or as we call the enemy "Jerry," was preparing.

After crossing a railroad at the foot of the hill we were hurriedly climbing the hill to gain the top when suddenly from the clouds a giant plane dove down upon us.

I have been under shell fire many times, in gas filled areas many more times and have had all kinds of "close shaves," but never before have I received such a fright as when that giant "Jerry" plane descended, pouring a double stream of bullets into our midst.

It is only natural that we who were closest scattered and took refuge in the many shell holes about us.

It was only a matter of a moment until we were delivering a deadly stream of lead in "Jerry's" direction and he evidently changed his mind about the counter attack as his massed formation was quickly broken up.

We again continued our advance and the result of the Argonne drive is well known, as our division penetrated a distance of ten miles when we were relieved by fresh troops.

I am happy now that this hideous war is ended and we soon will be "homeward bound," when I can relate many interesting experiences to my friends who are also connected with the metal industry. Corporal GEORGE R. PARSONS,

Company A, 136th Machine Gun Battalion,
American Expeditionary Force.

DESSELGHEM, Belgium, Nov. 27, 1918.

[Corporal Parsons was connected with the Parsons Machine Company, of Philadelphia, Pa., before entering the service.—Ed.]

WORK OF BUREAU OF STANDARDS ON ELECTROPLATING

TO THE EDITOR OF THE METAL INDUSTRY:

During the war most of the work conducted in this field was directed to meeting immediate military needs. With the close of the war such needs have decreased and some of the funds formerly derived from military sources are no longer available. In consequence it has not been found possible to retain the services of all the persons formerly connected with this work. From present indications, however, it is hoped to keep a limited force at work upon electroplating problems, at least until July 1, 1919.

We wish to take this opportunity to make public acknowledgement of the efficient co-operation of electroplaters during the war, and especially of the three members of the American Electroplaters' Society, Messrs. George B. Hogaboom, Fred J. Liscomb and Thomas F. Slattery, who at great personal sacrifice have devoted their entire services to this work.

The need and demand for research in this field has been emphasized by the experiences during the war. Efforts are therefore now being made to secure from Congress adequate funds to permit more extended research and more rapid progress upon these problems. It is evident that electroplating forms an excellent illustration of a "Key Industry," i. e., an industry which, while it is not itself of great magnitude, is often of fundamental importance to larger industries. Thus electroplating is essential to the manufacture of tools, builders' and saddlery hardware, plumbers' supplies, gas and electrical appliances, automobiles, silverware, jewelry, stoves, household utensils, mechanical devices such as phonographs, cash registers, sewing machines, adding machines, typewriters, cameras and other optical and scientific instruments, and, in fact, almost every industry in which finished metal articles of any description are produced. Progress in the art of electroplating will bring about corresponding improvements in all such industries.

Pending the acquisition of funds adequate to conduct extended or exhaustive investigations on electroplating, it seems highly desirable to obtain reliable information regarding the kinds and methods of plating now in commercial use. From such a preliminary survey, it is hoped to secure much information which can be made immediately available to platers and at the same time to define more clearly the problems most in need of investigation.

Accordingly, simple blanks have been prepared upon which platers are requested to submit information regarding solutions used by them. In order that such data may be reliable, and

representative of American plating practice, it is important to obtain replies from every commercial plater in the United States. Copies of the blank are therefore being sent out with the January number of the Monthly Review of the American Electroplaters' Society. Additional copies may be secured by application to the Bureau of Standards, Attention of Division V, Section 2.

S. W. STRATTON,
Director.

WASHINGTON, D. C., January 23, 1919.

SITUATION REGARDING POLISHING AND BUFFING COMPOSITION

TO THE EDITOR OF THE METAL INDUSTRY:

We do not believe that there will be a perceptible change in prices of buffing and polishing compositions for some little time to come, if we have any change within the next six months. This is due to three or four peculiar reasons; the first is that Europe is entirely devoid of fats, greases, waxes and fruit products, and it is necessary that we supply their wants.

The prices of buffing compositions are determined by the tallow and stearic acid markets. Stearic acid is very firm at the present moment, with the same prices prevailing as did six months ago. The price of stearic acid is determined by the demand for glycerines and red oils. Glycerine during the war was at a very high price. Since that time, or since the armistice, the demand has fallen off, consequently the price of this product has been lowered. Another thing is, that another by-product that counts, red oil, has dropped considerably in price, and the demand for it is not very strong, while on the other hand, most of the manufacturers of stearic acid have future business which was taken before the war ended, and which they are compelled to fill, and at prices that were in line when the orders were taken. So that there is not any excess or surplus stock, and inasmuch as stearic acid is the product which governs the price of buffing compositions, we can see no reason at the present time for expecting any decline in prices.

P. W. ELLWANGER,
Matchless Metal Polish Co.

Glen Ridge, N. J., January 9, 1919.

PREPARING PROSPERITY

TO THE EDITOR OF THE METAL INDUSTRY:

A great many people use from time to time phrases about money. They say that such and such a man "makes money." They start out themselves to "make money." But the very best money-maker in the world is—money. There is only one condition under which a dollar cannot make a dollar, that is the condition of inactivity.

Before many weeks the country will find itself embarked on a Liberty Loan drive, the drive for the Victory Loan, which Secretary Carter Glass estimates at $5,000,000,000, or, perhaps, more. Why should one subscribe for the bonds of this fifth loan? Patriotism, of course, is the motive; patriotism directed into a new channel.

The bonds of the preceding loan might, with all appropriateness, have been called Civilization Bonds, for our attention was focused outside ourselves. But now that the war has been gloriously won, and civilization saved to posterity, it is not selfishness on our part if we turn attention to domestic affairs.

The Government of the United States must pay its bills in order to prepare for the greatest prosperity of its history. And the people of the United States, who are called upon to lend the new capital, will be the sharers in that prosperity which is just ahead.

Preparing prosperity! Money makes money. If the Government can pay its bills for contracts entered into, the wheels of our machines can turn with redoubled speed. And this is not a selfish view, or a materialistic view. Who serves himself, serves mankind. The United States, by serving itself, by preparing prosperity, will render mankind the very greatest service possible.

JOHN PRICE JONES,
Assistant Director of Publicity, Liberty Loan Committee.

February 3, 1919.

NEW BOOKS

Industrial Engineering—By William M. Barr. Size 9 by 6½ inches. 620 pages, including index. Numerous illustrations. Bound in boards. Published by W. M. Barr Company. Price, $4.00. For sale by The Metal Industry.

In the preparation of this handbook the writer attempts a systematic arrangement of a considerable volume of useful information for engineers, much of which has not been readily accessible to the public. The collection includes separate specifications relating to the chemical and physical properties of practically all of the materials entering into engineering work for the United States Government. The importance and economic value of the data thus presented will be recognized by manufacturers and engineers engaged in Government work not only, but this value extends into every department in industrial engineering.

The usefulness of this handbook will not rest so much upon the extent of the compilation as upon the practical nature of the data presented, a feature made possible through the free use of working drawings contributed for insertion in these pages. Selections from these drawings appear throughout the entire work in carefully prepared illustrations accompanied in most cases by tables of working dimensions; these cover a wider range of detail than is common in books of this class.

Hendricks' Commercial Register of the United States. Pages, 2381, 7½ x 10 in. Published by S. E. Hendricks Company, Inc. Price, $10. For sale by THE METAL INDUSTRY.

The twenty-seventh annual edition of this register covers the same field and follows the same arrangement as the previous edition. The contents have been revised and corrected as nearly as possible to date of publication. The main portion of the book is a comprehensive register of producers, manufacturers, dealers and consumers of the products used by the iron and steel, mechanical, hardware, engineering, railroad, architectural, electrical, quarrying, contracting and kindred industries of interest to buyers and sellers. An alphabetical section introduced in last year's issue contains in one list the name, trade description and address of every company that appears in the main portion of the book. A list of trade names, brands, etc., covering 216 pages, printed on pink paper, separates the alphabetical section from the main portion of the book.

Cost Accounting—By J. Lee Nicholson and John F. D. Rohrbach. Bound in flexible leather. Size 8½ by 6 inches. 576 pages. Numerous illustrations. Published by The Ronald Press Company. Price, $6.00. For sale by The Metal Industry.

The book is just off the press and is undoubtedly the authority on up-to-date accounting methods, aside from the value of Major Nicholson's interpretations. It contains nothing that has not been successful in actual operation.

The establishment of adequate cost systems is explained, together with methods of controlling the cost accounts. Standards of depreciation are especially treated, and a fifty-page discussion of the Cost-Plus system is highly valuable. Eighty forms illuminate the text where details are intricate, and many charts summarize and present graphically every aspect of cost accounting.

Metals and Alloys—Size 6 by 9 inches, 32 pages, bound in boards. Published by THE METAL INDUSTRY, London, England, Price $1.25. For sale by THE METAL INDUSTRY.

This little book is a compilation giving the percentage composition of a great number of alloys, together with the purpose of all the known metals, breaking strength of metals and alloys, together with a number of other important and interesting items relating to over five hundred metals and alloys. Taking it all together it is a little book which would be found of exceeding value to all the users of metals.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

CASTING

Q.—We are called upon to make a casting of the following composition.

Copper	62.19%
Tin	.33
Lead	nil
Antimony	nil
Iron	8.57
Zinc	28.90
Manganese	.24

The casting to be made from this composition is 18 inches in diameter, 18 inches high and has a 7-inch core. Kindly advise us the method to be used in obtaining the above composition, also size and location of gates and risers.

A.—Sheet tin scrap is perhaps the best means of introducing the iron into this mixture. Use a good grade of electrolytic copper, melt very hot and add the iron a little at a time. Sufficient tin ought to be obtained from the iron so that it will not be necessary to add additional tin. The manganese can be next added in the form of 30 per cent. manganese copper. If the alloy is to be free from lead, high grade or electrolytic zinc should be used. The slabs of zinc should be broken into quarter and it may be added outside of the furnace.

As there is no aluminum in the mixture it should be cast in chill molds. Several inches can be added to the height of the molds to feed the castings and take care of the shrinkage.—J. L. J. Problem 2,664.

Q.—We are experiencing considerable difficulty in our machine shop from castings which are being made up of the following composition:

Copper	64%
Tin	2
Lead	2
Zinc	32

Can you suggest any remedy or advise us what the cause may be? We are compelled to live up to the above specifications for the metal.

A.—The mixture you name is not a very satisfactory one. If green sand molds are used, the castings suffer from "spelter streaks" and if the molds are skin-dried, the production of castings is much reduced. If aluminum and manganese are added to the mixture in small amounts to secure better casting qualities and fluidity, the alloy becomes to all intents and purposes a manganese bronze with its well known draw backs, of high shrinkage, etc. If the mixture must be adhered to, perhaps the best thing that can be done with it is to add a very small amount of aluminum. The aluminum seems to form a skin of oxide on the metal, lessens the volatilization of the zinc and gives better castings, but it increases shrinkage.

A more satisfactory mixture is the following:

Copper	76%
Tin	3
Lead	3
Zinc	18

This alloy is strong, tough, machines well and cannot be excelled as a cheap mixture for all general classes of work.—J. L. J. Problem 2,665.

CLEANING

Q.—We are in need of advice in our cleaning department. Our line of business is the manufacture of metal picture frames from .012 pickled and annealed steel. These frames are hung on stock racks after they are stamped to be used as needed. Our method of cleaning these frames before annealing was to wash them in benzine, then wipe them ready for enameling, and on account of the old process being too slow, we have been trying to substitute a good many cleaners for benzine, but find that the metal being very light will not hold heat long enough to dry the frames, thereby causing them to rust before they reach the enameler.

We would like to do away with benzine and substitute a cleaner, and also find some method of drying the frames, leaving them perfectly clean so that they can be enameled without being hand wiped.

A.—In connection with the chemical cleaning we might suggest that, following the cleaning and washing, an addition of 1 ounce of platers' black compound be made to each gallon of boiling rinse water. The immersion of the frames in the hot water containing the soap will cause the water to run away readily, and if you could arrange a whirler, rnn at a high rate of speed, the moisture would be entirely eliminated by centrifugal force. Another method would be to dry the frames in a heater at 200 degrees Fahr., or dry out in maple sawdust, after cleaning and washing as noted.

It is possible that if the frames were cleaned in a combination electro-cleaning and zinc plating solution that the film of zinc deposited would prevent rusting. Such a solution should be prepared in an iron tank with steam connections to heat it to 200 degrees Fahr. The tank should be made the anode and the work the cathode. The solution would clean the frames and also deposit a film of zinc. It is prepared as follows:

Water	1 gallon
Caustic soda	4 ounces
Soda ash	4 ounces
Zinc cyanide	⅛ ounce
Sodium cyanide	⅛ ounce
Yellow resin (powdered)	¼ ounce

The temperature of the solution as mentioned above should be 200 degrees Fahr. and the voltage, 5 to 10. One or two zinc anodes may be connected to the iron tank to assist in keeping up the zinc content. Occasionally add a small amount of zinc cyanide and caustic soda per gallon of solution, say ⅛ to ¼ ounce per gallon, and a little cyanide per 100 gallons. We believe this method of cleaning and depositing a film of zinc should overcome your trouble and also eliminate the use of gasoline.—C. H. P. Problem 2,666.

DIPPING

Q.—Could you give me a formula for dipping 10 and 14 karat gold after cleaning in a pickle, so as to get a very bright finish before enamelling with transparent shades of hard enamel. I do not desire to strip the pieces and I would state that I have used a solution made up of sulphuric acid, bicarbonate of soda and potash, but this does not seem to answer the purpose.

A.—We are not familiar with a method that will accomplish what you desire for certainly no acid combinations will produce a bright lustre. You might try a solution of cyanide and water set up as a small plating tank and use a reverse current. That is the articles are to be the anodes, the cathodes should be of lead or carbon. Use from 4 to 8 ounces of sodium cyanide per gallon at a temperature of 120 to 140 degrees Fahr. Frame up the articles preferably on iron or steel wire and keep them agitated while removing the remains of the fire-coat.

A simple method would be one of tumbling. If you could arrange about half of a five gallon wine keg so that it could be set up as a small vertical tumbling barrel at an angle of about 40 degrees and run by power, you could polish the 10 and 14 karat gold articles to any lustre. Use from two to four ounces of borax soap chips per gallon of water as the lubricating solution and use steel balls about 1/16 inch in diameter as the burnishing medium.

We believe that the method of tumbling will give you the most efficient results of the two processes.—C. H. P. Problem 2,667.

ENAMELING

Q.—What method is used in applying one or more colors of enamels on etched brass nameplates

A.—We presume that when two or more enameled colors are applied to etched brass nameplates the operation is done in sheet form before cutting. While we are not positive as to the methods followed, we believe the colors are applied by the air-spraying method and stencils used for the different colors. Two stencils would be required for red and black and these stencils so arranged that either color could be applied first. If red was applied, then the stencil would have to protect the parts to remain plain brass and the parts to be afterwards black. The second stencil would have to be made so that the red and brass is protected while the black is being sprayed on.

Frequently the black is a chemical black, produced by immersion in an ammonia carbonate of copper solution following the etching process. The red, however, would have to be applied as outlined above or filled in by brush.—C. H. P. Problem 2,668.

FINISHING

Q.—We wish to obtain a formula for a 14 karat green gold on which porcelain enameling can be done.

A.—In order to prepare a green gold solution it is advisable to first prepare a fine or yellow gold solution. We believe the best results can be obtained with gold and silver Trisalyt, although gold chloride and silver cyanide or chloride can be used. The following is a fine gold solution.

Water	1 gallon
Gold Trisalyt	½ ounce
Sodium cyanide	1/16 ounce
Phosphate of soda	¼ ounce

Temperature should be 120 degrees and 2½ volts. When the above solution is prepared and has been tried out, then add silver Trisalyt, which has previously been dissolved in a little hot water. Possibly ⅛ ounce will give the desired color. If a lighter tone is required, then more silver must be added.

Care must be used, however, in adding silver, otherwise it will predominate in the deposit. For a dark-green gold the same solution is used, with the addition of acetate of lead dissolved in caustic soda and water. A concentrated solution is prepared by the use of heat, and then a very small amount is added and the solution tested until the dark-green smut is developed. Upon relieving, a green gold with a dark-green background is produced. Use green-gold anodes. C. H. P. Problem 2,669.

MIXING

Q.—We are making valve castings, to be used on heavy hydraulic presses, which are tested to a pressure of 4,000 to 4,500 pounds. These castings are cored out, some with two cylinders and some with four. The valves are about eight inches square and the average thickness of the metal is from ½ to ⅝ inch. We use half new metal the other half gates, taken from the previous heat of these cylinder castings. We melt the metal in crucibles and are very careful as to our foundry practice. Please advise us as to whether there is a non-ferrous metal that will stand this pressure. The castings look to be good and do not show any shrinks, but the metal seems to be porous or else the high pressure forces the water straight through the metal.

We wish you would give us what information you can regarding the above and what mixture of metal you would advise for this class of work.

A.—The pressures you name are not far from the elastic limit of the alloys generally used for such work. However, you are recommended to try hydraulic bronze for the castings in question. The mixture is as follows:

Electrolytic or Lake copper	100
Sheet yellow brass	25
Tin	10

The yellow brass should be of good quality and not too light. Melt the copper, bring to a high heat, add the brass and finally the tin. Pour into ingots for remelting. Nick and break an ingot from each heat and examine the grain of the metal. It should be dense and fibrous. After the proper fracture has been once obtained, there will be no difficulty in recognizing it in future heats.

Absolute freedom from aluminum, antimony and similar metals must be assured or satisfactory results cannot be expected. It is best to melt quickly and pour at a fair temperature. The metal should be made quite hot and then allowed to cool to the fair pouring temperature and in pouring you had better pour somewhat too hot rather than too cold. By no means allow the metal to remain in the furnace when it is once ready for pouring. Do not break off the gates as, the metal may be injured by the hammer blows if not quite set, it being weak at a red heat in common with nearly all the brasses.—J. L. J. Problem 2,670.

RUMBLING

Q.—Would like some information as to process used for coloring nickel plated articles in a rumbling barrel, speed of barrel, etc The steel articles are knitting needles.

A.—For the purpose of burnishing steel knitting needles after nickel plated an oscillating barrel would be required so that the balls used for burnishing would have a sliding motion over the needles instead of a tumbling motion. Balls ⅛-inch in diameter and plenty of them will give you satisfactory results. For the burnishing medium use one to two ounces of tri-sodium phosphate per gallon of water and ¼ ounce of soap chips. The speed of the barrel should be from 6 to 10 revolutions per minute.—C. H. P. Problem 2,671.

PLATING

Q.—In our work we have a great many spot light reflectors to silver plate and until recently we had no trouble whatever. It has been our custom to run these reflectors in a single nickel solution for from three to five minutes and then rinse them in clean water and run them in the silver for about thirty seconds. The silver solution which we are using stands about three and one-half ounces of silver cyanide to the gallon and ten ounces of sodium cyanide to the gallon. We are using a six volt, 150 ampere dynamo and for the last four or five weeks we have had trouble plating these reflectors without some of them and somtimes all of them coming out of the silver with a line running around about half of the reflector. This line looks as though it might have been scratched there but upon close examination we find that it is just a break in the silver plate which buffs off when the coloring wheel is put on it.

Another thing which makes the matter still more perplexing is that we can silver plate these reflectors direct to the brass without nickel plating and have none of this trouble. Is there anything about the sodium cyanide which might cause this? We have made over our silver solution, taking out all the silver and making up a new cyanide bath, but still have the same trouble.

A.—There is nothing wrong with the sodium cyanide you are using, but the method of handling the reflectors after nickeling is at fault and probably causes the silver to buff off. In other words you have a blistered deposit. If the silver solution now contains as much free cyanide as when it was originally made up, the results should be the same now as then. To prevent such trouble use a separate strike for your reflectors after nickel plating. This strike may be prepared as follows:

Water	1 gallon
Silver cyanide	½ ounce
Sodium cyanide	6 to 8 ounces

Use several old steel knives for anodes as they are hard and will not reduce. All that is necessary to do to keep up the solution for striking purposes is to add a little cyanide and a very small amount of your regular silver solution occasionally.

This is the method the auto lamp manufacturers use. If you follow it you will have no trouble in the future. Your regular silver solution is somewhat strong, two and a half ounces of silver cyanide per gallon of solution should be ample if you use the bath for plating reflectors only.—C. H. P. Problem 2,672.

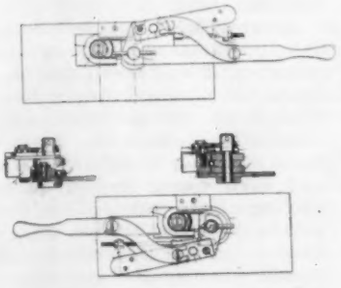
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

The age of these patent notices is due to the delay in the issuing of patent reports.—Ed.

1,283,140. October 29, 1918. **Tube-Bending Machine.** William P. Frank, Chicago, Ill.

This invention relates to improvements in tube bending machines, and has for its object the provision of an improved machine of this character, as shown in cut, by means of which tubes may be readily bent in different forms without buckling or distorting the same.

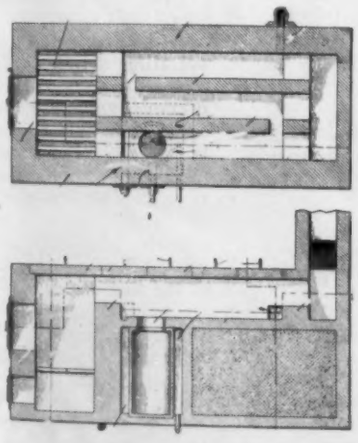


The patent covers:

A tube bending machine comprising a bending head; a bending lever co-operating with said head; a supplemental bending lever pivotally mounted on said lever; a die member carried by said supplemental bending lever and co-operating with said head; a handle lever pivoted on said bending lever and operatively connected with said supplemental lever to press said die member against said head in operating said bending lever and a plug carried by said supplemental lever and insertible in a tube operated on by said die member and head.

1,283,427. October 29, 1918. **Refining Lead Alloys and Alloys Containing Lead, Tin, Copper and Antimony.** Fred A. Stief, East St. Louis, Illinois.

This invention relates particularly to processes for removing arsenic from mixtures containing tin, antimony, lead and arsenic. No claim is made herein for the apparatus. The invention consists in exposing the molten mixture of metals to the action of iron, limestone or lime in a furnace, and separating the arsenic from the mixture in the form of speiss, which is composed largely of arsenic and iron or calcium in the form of an arsenid or an arsenate. The operation is performed in a furnace of special design, as shown in cut, wherein the metal is exposed to the action of the heat but protected from the action of the furnace gases, and which furnace may be equipped with a separator for separating the speiss from the fluid metal.



1,283,264. October 29, 1918. **William E. Mowrey, St. Paul,** Minn.

This invention relates particularly to alloys designed for use as substitutes for platinum in the manufacture of jewelry, scientific instruments, dental supplies, electrical apparatus, etc.

One object of the invention is to provide an alloy which will be cheaper than platinum but shall not be inferior to it for the purposes for which it is designed.

Another object is to provide a substitute for platinum which with certain percentages of materials used shall possess a color such as will render it indistinguishable from platinum.

Another object is to provide an alloy as a substitute for platinum that shall be non-oxidizable.

The claim made for this invention is:

An alloy for dental, jewelry and electrical purposes, comprising substantially 15 per cent. of palladium, substantially 35 per cent. of silver, and substantially 50 per cent. of gold fused together.

1,283,973. November 5, 1918. **Method of Electro-Plating.** William Thum, of Hammond, and John J. Mulligan, of East Chicago, Indiana, assignors to United States Metals Refining Company, of New York, N. Y., a corporation of New Jersey.

The invention relates to electroplating the surfaces of steel, iron, ferrous alloys and kindred base metals belonging to the more electro-positive series of metals, with lead, copper or kindred metals belonging to the more electro-negative series.

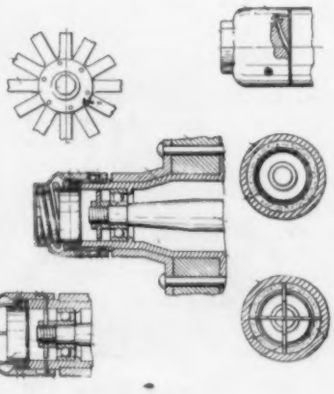
The object of the invention is to obtain a homogeneous and firmly adhering deposit of the plating metal directly on the steel, iron or kindred metal surfaces.

To this end the contact reactions (some of which are of a purely chemical or catalytic action) which usually result from the contact of the base metal with the electrolyte containing acids or producing free acids in the process of electrolysis, and which cause such porosity in the shape of pin holes as to render a thin plating useless as a protective covering for the baser metal, are prevented by the direct electroplating of the surfaces of the base metal with an initial thin, smooth, homogeneous and adhesive coating of a plating metal such as lead which protects the base metal from contact with the electrolyte during the continued deposition of the plating metal.

1,283,967. November 5, 1918. **Hub-Cap.** Frank G. Taylor. Sturges, Michigan.

The main objects of this invention are:

First, to provide an improved hub cap which may be very quickly applied or removed and when applied is securely retained and also effectively retains the lubricant.



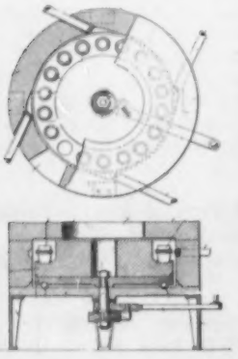
Second, to provide an improved hub cap adapted to be substituted for hub caps now extensively used on motor vehicles.

These hub caps are made of brass and aluminum in order to avoid rusting and to secure lightness. The patent covers the following claim:

In a structure of the class described the combination of a hub provided with joint lugs, a cap having internal bayonet joint grooves coacting with said lugs, a coiled spring disposed in said cap so that it is under stress when the joint members are engaged and acts to retain them in engagement, a packing member projecting into the inner end of said spring and having an outwardly projecting flange at its inner end bearing against the end of the hub, and a packing ring disposed on said packing member between its flange and the end of the spring.

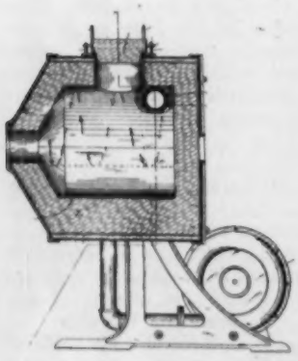
1,284,711. November 12, 1918. **Metallurgical Furnace.** John Kralund, Brooklyn, N. Y., assignor to Doehler Die Casting Company of the same place.

The invention consists primarily in a metallurgical furnace embodying therein a refractory side wall having an opening therethrough, means for developing the required temperature within said wall, a traveling support of refractory material within said wall, said support being adapted to receive a plurality of melting pots or crucibles adjacent the outer edge thereof, means adapted to impart movement to said support to bring said melting pots or crucibles successively in position adjacent said opening whereby said melting pots or crucibles may be inserted in or removed from within said furnace one at a time and will remain therein a sufficient time to insure the desired conditioning of the metal therein contained, and in such other novel features of construction and combination of parts as are set forth in the cut.



1,286,719. December 3, 1918. **Melting Furnace.** L. H. Muckle, Denver, Col., assignor to the Case Manufacturing Corporation of the same place.

This invention relates to improvements in melting furnaces for reducing the contents thereof to a molten state with exceeding rapidity and without oxidation occurring.



It is true that furnaces have heretofore been in use, employing inserted crucibles or like containers, wherein the heat applied to the metal to be melted is an indirect or a radiated heat, which will not, to any great extent, cause vaporization and oxidation of its volatile constituents, resulting in an oxidized scale-like scum or slag.

In carrying out the present invention a novel type of furnace has been constructed, whereby a highly intensified naked blast flame, after conversion into its resultant hot gases, is caused to swirl therearound in such manner that the hot gases travel in a spiral sheet-like path from the rear to the forward pouring end thereof, with the top and side walls of the furnace confining and directing the initial flame and its hot gases, after complete combustion has taken place, across the metallic mass itself, the said mass, whether partly or wholly molten, serving eventually as a bottom confining liquid wall or body surface for the blast, manifestly providing for a more direct and intimate heating of the molecular particles of said mass, but without causing the oxidation thereof.

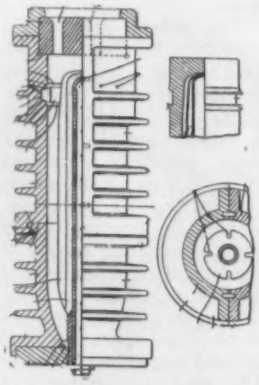
1,286,921. December 10, 1918. **Bearing Alloy.** W. D. Berry, New Brighton, Pa.

The object of this invention is to provide an alloy for journal bearings for railway car and locomotive axles, rolling-mill roll axles, and in general for axles for all classes of machinery, which alloy will for its intended purpose be in every respect equal to the well known copper-tin-lead alloy, but which will contain no tin and hence may be manufactured considerably cheaper than the usual alloys for bearings, the tin being accordingly conserved for other purposes.

The alloy is essentially a copper base alloy, the percentages of copper and lead depending somewhat upon the requirements for particular service conditions. Specifically, the alloy may contain from about 60% to 85% copper, from about 1% to 36% lead, and, depending upon the degree of hardness required, from about 3% to 20% antimony. As an additional hardening agent, and also as a deoxidizer, from about .25 to 3% phosphorus may be added to the alloy. If desired, small quantities of nickel, manganese, silicon or magnesium may be added as a deoxidizing agent or agents.

1,286,375. December 3, 1918. **Method of Producing Cast Shell Projectiles.** John C. McLachlan, Toronto, Ontario, Canada.

This invention relates to a method and apparatus for producing projectiles or shells, and is an improvement upon the invention disclosed in a prior specification, 56,365, filed October 18th, 1915.

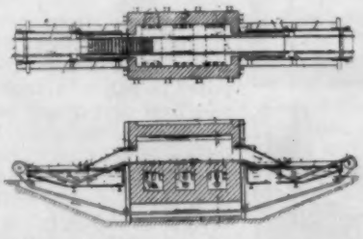


In projectiles produced with the apparatus of said prior application, it was found that the edges of the annular groove formed in the projectile and adapted to receive the driving band could not be formed sharp and even owing to the quick cooling of the metal. It is the principal object of this invention to provide a method and means whereby the said edges may be made sharp and even, to fit snugly to the driving band.

The principal feature of this invention consists in the method of forming the annular groove for the driving band by molding the metal forming the marginal edges of the groove to project beyond the main surface of the body of the projectile and subsequently removing the projecting portion.

1,288,353. December 17, 1918. **Annealing-Furnace.** William A. Wood, of Dunellen, N. J., and Walter S. Rockwell, of New York, N. Y., assignors to W. S. Rockwell Company, of New York, N. Y., a corporation of New Jersey.

This invention relates to that class of furnace in which metallic articles are heated in a non-oxidizing atmosphere, and are discharged directly into a tank of water in order to cool them, thus avoiding rusting or tarhishing.



Such furnaces are especially applicable to the heating of metals or metallic articles for the purpose of annealing or softening the same; and the object of the present invention is to obviate the necessity of using a closed retort to maintain a non-oxidizing atmosphere during the heating operation, and also to obviate the necessity of employing a water-seal at the inlet and outlet of the heating-chamber to maintain such an atmosphere therein.

These objects are attained, first, by heating the metals in a furnace-chamber which is supplied with the hot products of combustion containing no excess oxygen from oil or gas-burners, thus applying the heat directly to the metallic articles instead of to the outer wall of a retort or muffle. Second, securing a non-oxidizing atmosphere in such heating-chamber by the continuous introduction of such products of combustion; and third, by extending hoods from the opposite ends of the heating-chamber directly into proximity to the surface of water in suitable tanks, but leaving an interspace from which the gases escape, and which are continuously poured into the heating-chamber by the fuel burners.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

THE METAL INDUSTRY assumes no responsibility for statements made by manufacturers in articles in this department.

THE CARE OF FURNACES

One of the things that a foundry man has to reckon with is the fact that his furnaces wear out. The lining which is of firebrick gets chipped out, cracked or slagged off in such a way as to impair the heating efficiency of the furnace. The manufacturers of Hytempite, a high temperature furnace cement, the Quigley Furnace Specialties Company of 26 Cortlandt street, New York, state that this compound is proving itself to be a friend in need to the metal melter.

In June, 1916, THE METAL INDUSTRY published a series of tests on Hytempite which showed it to be a superior material for resisting higher temperatures. In September of the same year was published the story of the rescue of a crucible by means of Hytempite, and now we are able to show a picture of how Hytempite is used to reline a furnace and prolong its life. In a circular recently issued by the company the following directions are given for the use of Hytempite for a plastic material for rammed-in linings, and repairing pit or tilting crucible or open flame furnaces, repairing annealing furnaces, boiler settings, etc. Add about 175 pounds of carborundum, fire sand, crushed fire brick, ganister, finely broken crucibles or other suitable refractory to a solution of 16 pounds of water and 100 pounds of Hytempite. When thoroughly mixed and free from lumps the material should be about the consistency of moulding sand; that is, just damp enough to hold together when squeezed tightly in the hand, but should show no free moisture. If too wet, it will not pack together tightly, but will spring back and be soggy. This mixture can also be used for making special tiles required in a hurry, lining ladles, etc.

Hytempite should be stored in a cool place; after removing amount required jar remainder down level and cover with water to exclude air, pour off water before using again, or, if used frequently, cover with wet cloth. It is advisable to place receptacle containing Hytempite as near the work as possible and work directly from same, if convenient.

Ordinarily both faces of the brick or tile should be buttered thin and squeezed or tamped together to insure a close fit or the cement may be thinned with water to the consistency of mud or a thick batter and the bricks dipped, as preferred. Practice will soon show the most suitable and least amount which should be used. The excess can be used for pointing.

When Hytempite is diluted (by addition of warm water) and used as a batter, or when the bricks are moistened before applying, it does not set as rapidly; therefore, more time should be allowed for drying.

Care should be exercised in not breaking the union or moving the pieces joined after Hytempite commences to set.

When used as a grout, dilute with warm water, add broken fire brick, carborundum or any good quality fire sand, which reduces the quantity required for filling large spaces, tying walls, etc.

NEW TANK RHEOSTAT

A new type of tank rheostat has recently been put on the market by The Connecticut Dynamo & Motor Company of Irvington, N. J. While in construction it differs greatly from anything previously sold for this purpose, yet the basic principle is an old one, and has been used with great success in rheostats for other purposes.

The device consists of a series of plates composed of carbon, graphite and a mixture of these two substances, or a mixture of graphite and metal, depending upon the current and voltage of the circuit in which the rheostat is to be installed.

These plates are arranged in series and parallel by the insertion of a number of copper plates connected to two copper conduction bars. This arrangement is ingenious and entirely new. The copper plates are silver-plated to prevent corrosion, for it has been determined that while copper is a good conductor of electricity, copper oxide is a poor conductor, while both silver and its oxide are good conductors. Therefore, these plates retain their conductivity whether they become oxidized or not.

LINING UP FURNACES WITH "HYTEMPITE" AT THE FOUNDRY OF WALKER H. LEVITT COMPANY, NEW YORK.

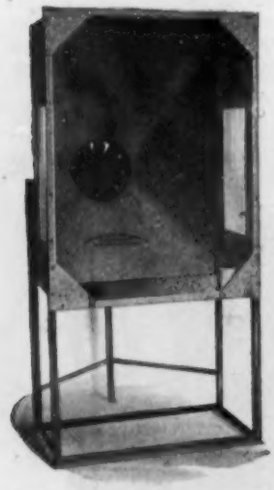
The voltage and current at the tank is regulated by varying the pressure on the carbon plates. This is done by means of the screw and handwheel. This permits the operator to obtain any voltage on the tank from zero to the full voltage of the dynamo. The voltage may be raised or lowered gradually and not in steps. This regulation can be obtained independent of the amount of work in the tank. That is, any voltage can be obtained whether only one small piece of work is in the tank or the tank is full of work.

A voltmeter mounted on the face of the rheostat is part of the regular equipment, and an ammeter can also be mounted beside the voltmeter if desired.

The Connecticut Dynamo & Motor Company has issued a new catalog which describes this rheostat as well as their line of plating dynamos and other plating room equipment.

PORTABLE SPRAYING HOOD

The Cleveland Blow Pipe & Manufacturing Company, Cleveland, Ohio, has placed upon the market a portable spraying hood which they state is to meet the requirements of concerns needing a small outfit. It has been found that a good many of the spraying hoods now in use are so large for small work that the suction vacuum created by the fans most in use is not adequate for removing the obnoxious lacquer fumes. A receptacle is placed upon the inside of the hood for holding the spraying outfit. The motor connected exhaust fan can be attached to any electric socket and requires no special wiring.



PORTABLE SPRAYING HOOD.

As shown in the accompanying cut, the gusset plates and angle iron frames make a strong construction, while the chief feature of the hood is its portable nature so that it can be used in various parts of the plant. The hood is made from a heavy gauged galvanized sheet iron strongly reinforced, while the size is 3 by 4 by 7 feet 4 inches high. Further information may be had by corresponding with the above company at 6950 Kinsman Road, Cleveland, Ohio.

SOLDERING FLUX OR FLUID

By H. J. Davis

The great world war has brought many marked changes in the chemical industry in the United States and all over the civilized world. The demand for substitutes has been widespread, owing to many of the most useful chemicals being used to carry on the war.

One of the many chemicals most essential for war production has been muriatic acid and non-acid fluxes, the demand for both of these products has been enormous. The demand for the muriatic acid for soldering on galvanized iron and other heavy metals has been so great, that metal craft trades have been compelled to use a soldering flux or fluid. These soldering fluxes will solder almost any metal but aluminum, even soldering galvanized iron, but the muriatic acid seems to hold a little stronger than the soldering flux that is on some classes of work.

However, the soldering flux has done its bit, for it has many advantages over the acid, for it is absolutely non-poisonous, non-inflammable and non-corrosive. The flux has been in great demand by the canning industry also in the manufacture of aeroplanes and munitions, and by gas defense workers doing fine soldering on gas masks for our fighters.

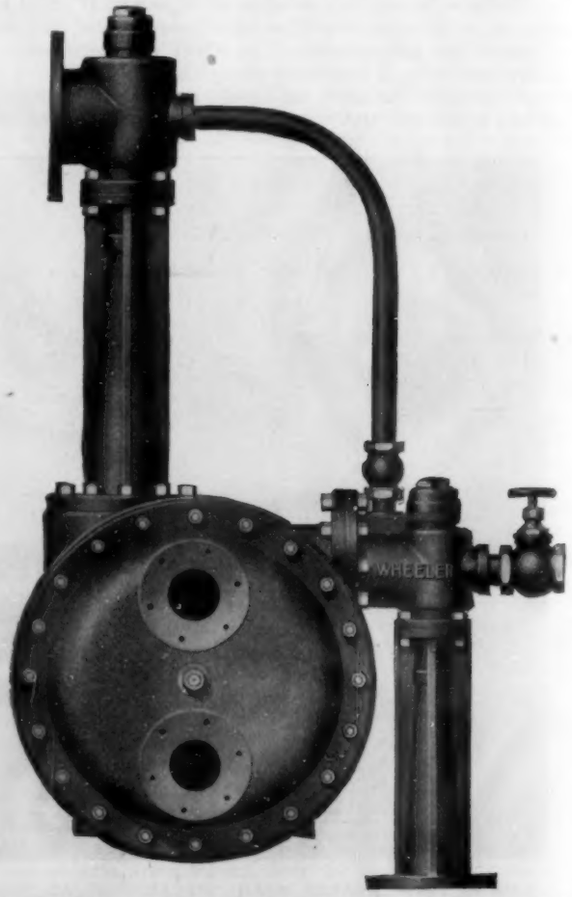
The Davis Process Company, Brooklyn, N. Y., a new chemical concern which has been established during the war, are the makers of a very good and reliable soldering fluid, known as the "Art Craft Soldering Fluid." Many soldering fluids or fluxes have been invented and on the market for years, but the brand this firm manufactures seems to be popular among metal workers doing soldering and who call for efficiency, labor saving, and a fluid that will not corrode, rust or set forth foul odorous fumes, and above all is non-acid. Soldering fluid simplifies soldering, keeps the mechanics tools in a clean condition, and can be shipped in almost any kind of a receptical, whereas the ordinary acid is generally shipped in the old fashioned cumbersome carboys and the larger quantities in iron or steel drums.

Can making and soldering machines, also dipping machines require a soldering fluid that will not splutter, also a fast flowing fluid; the above mentioned fluid has proven very efficient in turning out good work from these machines.

The Davis Process Company will be pleased to send samples of their product to any firm doing soldering. The company reports that they are also going to manufacture a soldering paste and soldering salts under the same brand name in the near future.

STEAM JET AIR PUMP

The Wheeler Condenser & Engineering Company, of Carteret, N. J., announce that they have obtained from the Schutte & Koerting Company, of Philadelphia, Pa., through the Alien Property Custodian the exclusive right to manufacture and sell steam jet air pumps under patent No. 968,926 in connection with surface condensers, jet condensers, barometric condensers, vacuum pans and evaporating apparatus.



THE STEAM JET AIR PUMP NOW MADE BY WHEELER CONDENSER AND ENGINEERING COMPANY, CARTERET, N. J.

This patent covers the valuable feature of two or more steam jets working in series with a condenser between the jets—a feature that enables this type of pump to perform a given duty much more efficiently than any steam jet not so equipped.

The photograph herewith shows this steam jet air pump. Upon request test data and full information will be sent by the Wheeler Condenser & Engineering Company to any reader of this publication.

PLANT OF THE ELECTRIC FURNACE CO.

Peace has come abruptly, and American industry is again thrown completely upon its own resources. Problems are developing that call for better production methods than those which have long been considered standard. A tangible proof of an industrial demand for more modern methods is found in the large plant just occupied by The Electric Furnace Company at Salem, Ohio. This factory is used exclusively for the manufacture of Baily furnaces for the electrical heat-treating and annealing of steel and melting of metals.

The ever-widening field of work to which electricity may be applied has attracted the greatest interest throughout industry. Every month we read of new electrical inventions that accomplish tasks generally considered impossible. We have long been familiar with the common uses of electricity, but modern research now demonstrates that heating problems also may be solved by drawing furnace current from the same central station that drives the motors in the factory. A consideration of the Baily factory is worth while, not so much from a standpoint of shop equipment, but from a viewpoint of the unique features that make an electric furnace plant distinct and modern.

THE PLANT OF THE ELECTRIC FURNACE COMPANY AT SALEM, OHIO.

The imperative demands of a growing business led to the equipping of the plant shown in the illustration. This two story factory with about 70,000 square foot of floor space is located on a tract of nine acres along the main line of the Pennsylvania Railroad at Salem, Ohio. This modern factory has a two-story main building, 96 feet, fronting the Pennsylvania, and 100 feet, facing Wilson street. Adjoining the main building are two sawtooth roofed buildings, one 201x97, and the other 97x54 feet.

As you enter the general office building, the view on the left reveals commodious offices; the right wing, however, is devoted to a large record-room. Here all specifications and drawings of the particular needs of furnace customers, are carefully preserved.

Adjoining this office wing, is a large, well-lighted drafting room. While this room is unusually large in size, it is no more than adequate, because electric furnaces, especially large automatic types, require the highest mechanical skill in design, and this floor furnishes a pleasant and ideal location for securing the infinite detail of the drafting room. A blue print room in the rear is provided with the usual equipment.

One other exclusive feature of this room is worthy of attention. A large routing board on the north wall offers a very thorough and modern method of keeping track of production by showing the exact routing of all materials and the progress made on every contract handled.

SPECIAL ELECTRIC FURNACE LABORATORY.

In the northwest wing of the factory a special electric furnace laboratory is maintained, including a modern chemical laboratory for making analyses and conducting tests upon various metal and upon refractories and furnace construction parts as well.

An adjunct to the laboratory is found in a modern electric brass foundry, where two standard 7-ft. 105 K. W. Baily furnaces are making tests on specific materials, and, in addition, are producing copper castings required in the factory. This is of special importance because these copper castings must have a high electrical conductivity which is difficult to obtain in any other furnace practice. A smaller 40 K. W. furnace is used for small intermittent test of refractories and alloys. The entire equipment makes possible the most efficient research into chemical and metallurgical fields. The dirt, smoke, fumes and flame of the pit-crucible plant are entirely absent in this ideal foundry.

SWITCH AND TRANSFORMER CONSTRUCTION.

Passing from the foundry, a steel-tank assembly room is found, where sheet steel is flouted and oxy-acetyline welded into tanks for transformers. Later these tanks go to a foundry where steel tops and bottoms are cast on them.

The machine-shop, although modern in every respect, deserves only passing mention here. The switch shop, on the other hand, is distinctly interesting, because its expert machinists must perform some of the most delicate operations that electric furnace construction demands. It was very difficult in the early days to find satisfactory low tension switch equipment until one of the company's engineers designed the present selective oil break switch. These are built with the greatest accuracy, and most careful fitting, yet all parts of the switch are interchangeable.

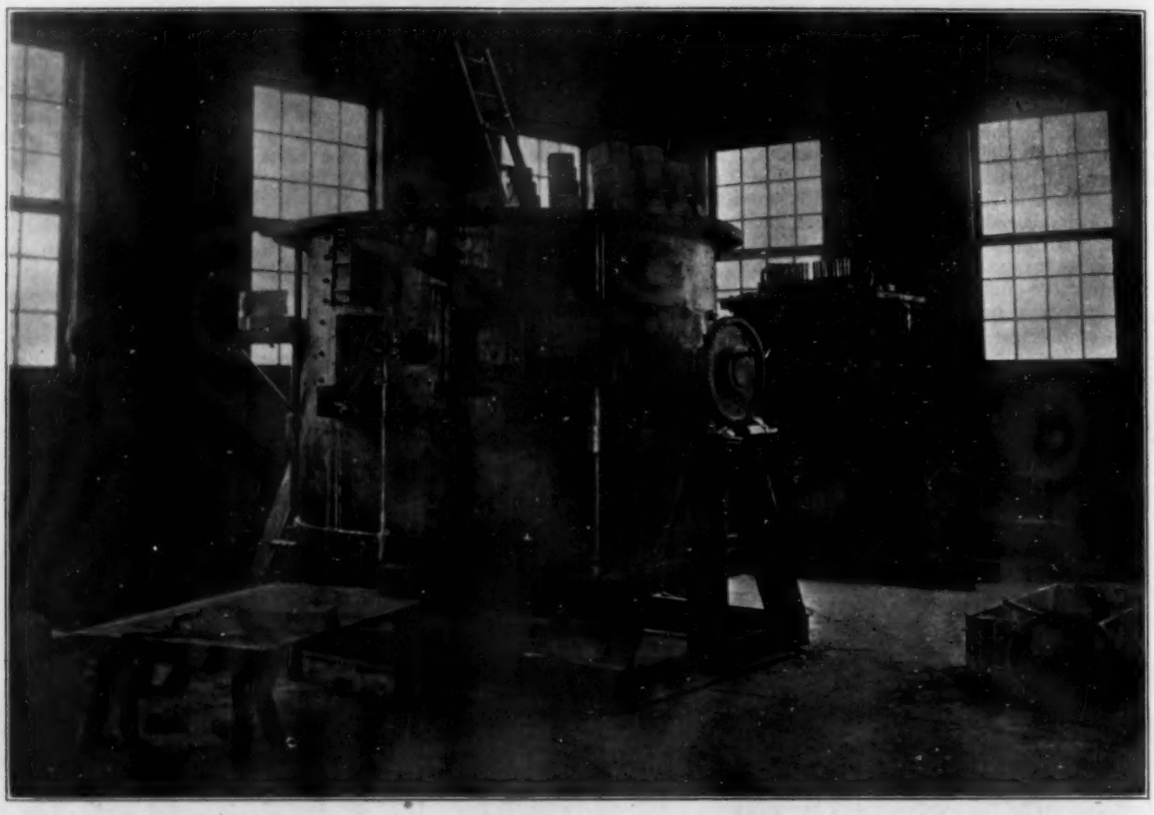
Following the transformers out to the assembly floor, much of electrical interest may be seen. Here transformer coils are loaded on blocks to await the coils that are receiving treatment on the other side of the floor. Coils are here, too, ready to be impregnated, and in the rear of the room winding lathes are drawing copper wire from a score of drums. Material must be carried in stock sufficient to provide for the needs of transformers for voltages up to 22,000 and in the whole range of sizes.

Three stock rooms are maintained. In addition to the

general and pattern storage rooms, a large space is devoted to brick and refractory storage. A large stock of special brick is necessary to assure prompt furnace shipment.

Pennsylvania siding adjoins the floor that the product may be easily loaded upon cars.

As a whole, The Electric Furnace Company has a plant



BUILDING A BRASS MELTING ELECTRIC FURNACE AT THE SALEM, OHIO, PLANT OF THE ELECTRIC FURNACE COMPANY.

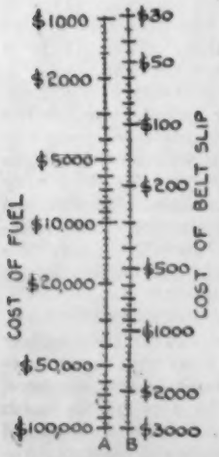
The last floor is devoted to structural assembly. Here the structural steel shell of the furnace is finally assembled, with all its external and internal equipment. A special

that represents clearly the growing use of electricity as a source of heat for just as wide a field of heating operations as that which it now dominates for light and power.

THE COST OF BELT SLIP

By W. H. Shaphorst.

The Cling-Surface Company, Buffalo, N. Y., in its more than 20 years of existence has done much toward conserving fuel and saving belts by eliminating belt slip. It has made belt slip and its attendant costs and troubles a special study. Readers will, therefore, be interested in the small and handy accompanying chart and the "Cling-Surface Formula" for more accurately figuring slip costs.



THE CHART

Referring first to the chart, Column B shows roughly how much money Cling-Surface will save.

For example, if you spend $10,000 per year for fuel (See column A) and if all the power developed is sooner or later transmitted through belting, column B (opposite the $10,000) shows that $300 can be saved by stopping slip.

In the above scale 5 per cent total slip, including creep, is assumed, which is a very low assumption.

If all of the power is transmitted through a main belt and the main belt slips 5 per cent, **The Annual Preventable Loss In That One Belt Is $300.**

In the face of these facts it is evident that the cost of Cling-Surface is practically "zero" when compared with the money it saves through elimination of slip.

To assist the reader still further in correctly and simultaneously computing slip and costs this formula has been developed:

$$C\left\{\frac{0.98\ dn}{-DN}\right\} = \$ \text{ wasted per year.}$$

Where C=Cost of power per year for the given drive, dollars.
d=diameter of driven pulley plus belt thickness, inches.
n=r. p. m. of driven pulley.
D=diameter of driving pulley plus belt thickness, inches.
N=r. p. m. of driving pulley.

If the reader doesn't like formulas, it can be done by following these simple rules:

(1) Add diameter of driven pulley to belt thickness, inches, and multiply by r. p. m. of driven pulley.

(2) Add diameter of driving pulley to belt thickness, inches, and multiply by r. p. m. of driving pulley.

(3) Divide (1) by (2).

(4) Subtract (3) from 0.98.

(5) Multiply (4) by the cost of power in dollars per year for the drive.

The result is the dollars wasted per year because of unnecessary belt slip.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

INSTITUTE OF METALS DIVISION

W. M. Corse, chairman of the Institute of Metals Division of the American Institute of Mining Engineers, has sent out the following announcement:

"To Members of the Institute of Metals Division.

"I want to call your attention especially to the ballot which has been sent out from the secretary's office relative to the proposed change in names from the 'American Institute of Mining Engineers' to the 'American Institute of Mining and Metallurgical Engineers,' which more nearly designates the true scope of the society. It would seem to me very important, particularly as our Executive Committee has voted unanimously in favor of it, that all members vote in favor of this proposition. Will you, therefore, be sure to see that your ballot is returned giving your vote on this subject? Your failure to vote may result in the defeat of the proposal, because those who are against the change may not be as indifferent as you are.

Our first meeting with the American Institute of Mining Engineers will take place in New York February 17-20, 1919.

"The program this year provides for the Institute of Metals Division's meeting on Monday, February 17. You can get details from the Bulletin. There are sessions on other days of general interest to our members, but Monday is set aside as 'Institute of Metals Day,' so be sure and be present then.

"The program is a strong one. It contains a paper by Mr. W. H. Bassett, which is of great interest, and one by Mr. Zay Jeffries which is also very valuable. As the last paper for the day we have placed that by Mr. Jerome Alexander, entitled 'Metals and Alloys from a Colloid-Chemical Viewpoint.' Mr. Alexander is particularly well informed on the subject of colloidal chemistry. He presents his subject from a somewhat new viewpoint, but one of great interest to our membership. Do not fail to attend the session on Monday afternoon, even though you cannot arrange to be present on Monday morning. Better still, take them both in.

"The Institute of Metals Division has selected the Hotel Seville at Madison avenue and 29th street as headquarters for this meeting. All of our members who can should plan to secure reservation at that hotel, as the number of rooms available is limited, I would suggest that you reserve promptly.

"The proposed exchange of Transactions with the Institute of Metals of Great Britain has been adopted. Our members can now secure from the Institute of Metals of Great Britain their Transactions at half price; namely, $5 per year, postage not included. The membership of the Institute of Metals costs $10.50 per year, so that this arrangement is a decided advantage for our members. In return we are offering them our volume of Transactions at less than one-half of our membership fee, namely, $5, postage not included.

"It will be necessary for them to know in advance about how many copies of their Transactions our members will desire. Will you therefore notify our secretary, F. L. Wolf, care of The Ohio Brass Company, Mansfield, Ohio, if you desire your name put on a list to receive Transactions of the Institute of Metals of Great Britain at one-half the regular price. This would seem to me a great opportunity for our members as these Transactions are very valuable.

NEW BRASS FOUNDERS' ASSOCIATION

Word comes from F. H. Landolt, of Brooklyn, N. Y., that a new brass founders' association has been organized, which is composed of a number of the leading brass founders in the various lines of industry. The object of the association is to better the conditions of the brass foundry trade, and an invitation is extended to the trade at large to join the association. The secretary will at all times be glad to notify the members of the meetings which are now scheduled to be held once a month. The officers of the association who have been elected for 1919 are: F. H. Landolt, 117 Dobbin street, Brooklyn, N. Y., chairman, and W. H. Paulson, 97 Second avenue, of the same city, secretary and treasurer.

AMERICAN ELECTRO-PLATERS' SOCIETY

New York Branch—Thomas B. Haddow, president, and William Fischer, secretary and treasurer, 300 St. Anns avenue, New York.

At the last meeting of the New York Branch Mr. Housholder exhibited a large number of samples that were deposited in single nickel salt solution of different concentrations; nothing else being used but water. The various solution contained from 12 ozs. to 48 ozs. single nickel salts per gallon. He found that the solution containing less than 18 to 20 ozs. per gallon had to be used warm in order to obtain a good deposit.

The laboratory committee took charge of the samples and will put the data in shape for the use of the members. In discussing the cause of work coming from the silver solution with yellow stains, various causes were given, i.e., lack of free cyanide, too much carbonate, impure cyanides containing sulphur and the need of a little carbon disulphide providing the solution had already contained this compound.

A member asked what caused the rusting of booster shells before and after lacquering. The consensus of opinion was that the shells were not properly rinsed after pickling. It was suggested to dip in a hot solution of sodium carbonate after pickling, rinse thoroughly in cold water, then heat in boiling water. The shells would dry of their own heat provided the water was boiling.

Final arrangements for the banquet to be held Saturday, February 22, were made, and the speaker of the evening will be Dr. M. C. Burt, director of research and experimental laboratories of the Atlas Powder Company, Wilmington, Del.

Providence Branch—Meets first and third Thursdays of each month at 26 Custom House street, Room 16. Secretary, Albert J. Lemrise, 124 Waverly street, Providence, R. I.

The first meeting of 1919 was held on January 2, with President Weigand in the chair. Applications from Messrs. Egan, Gallon, Critchly, Cavanaugh, Gothro and Fitzgerald were presented to the board. It was suggested that all future applications be elected by secret ballot and the matter was voted on and carried. After other matters of minor importance were disposed of President Weigand made an address on the splendid work of Gavin J. Tyndall, chairman of the Board of Managers, and thanked him for his continual activity. At the close of his remarks President Weigand presented Mr. Tyndall with a diamond scarf pin, stating that although the token was of no great material value, it would no doubt accomplish its message to the owner, reminding him of the high esteem which every member of the branch held for him.

Manager Tyndall suggested that the name of Attleboro be added to that of the Providence Branch, thus giving the members from the Attleboros recognition. This matter was discussed, voted on and carried.

Philadelphia Branch—Philip Uhl, secretary, 2432 North 29th street, Philadelphia, Pa.

The dates for the annual convention which is to be held in Philadelphia this year have been set for July 1, 2 and 3, 1919. The Philadelphia Branch will hold an extra meeting on the third Friday of each month, at which time only convention plans will be formulated.

Mr. Anthony Manguette, formerly a foreman plater and member of the Philadelphia Branch and more lately first class gunner of the Royal Flying Corps, was present at the meeting and received a hearty welcome from the members. Mr. Manguette gave a vivid description of aerial fighting and bombing and also stated that he and his pilot had an accident with their plane and that he had suffered from serious nerve shock. Mr. Manguette spent several months in a convalescent camp in Canada, but has now received his discharge.

Among the topics for discussion at this meeting was that of zinc plated steel hooks which were shown by Mr. Moore.

CHICAGO BRANCH OF THE AMERICAN ELECTRO-PLATERS' SOCIETY HOLDS A BANQUET

SPEECH MADE BY SUPREME PRESIDENT WALTER FRAINE AT THE ANNUAL BANQUET, JANUARY 18, 1919.

Mr. Toastmaster and Gentlemen:

While I have had the pleasure of meeting many of the members of the Chicago Branch at the various conventions, this is the first time in several years that I have been with you on an occasion of this kind, and it is certainly a delight to me to meet so many of the men who I have come to regard as personal friends. It has been my privilege to associate with some of those present here tonight in trying to advance the purpose and aims of the society and it has always been a source of gratification to me to see the cordial and loyal snpport given by the Chicago Branch as a whole and its members as individuals to advance the interests of the society.

I have no particular topic to talk about tonight, but one or two thoughts come to me that I would like to pass on to you. First of these is to call to your attention the fact that we have at the head of the society, serving the members to the best of their ability, the officers of the Supreme Society, who act as a clearing house, if you please, for the business of the branch societies in their relation to each other and endeavoring to mold them into a homogeneous whole. This work takes much of their time and is, as you know, more a labor of love than of recompense. They give their time and energy in order that the work of the society may proceed smoothly, to try to reconcile differences which inevitably arise, to guide by wise counsel, and to promote the welfare of the organization. It should be, as I am sure it is, your part and pleasure to aid these, your officers, with advice and suggestions. I am sure that they will appreciate such evidence of your interest in their work and will be pleased to have your help in advancing the purpose and aims of the society. While there is an old proverb to the effect that "too many cooks spoil the broth," at the same time remember, "there is strength in numbers." Help them with your kindly criticism, advice and suggestions. They will appreciate it and will be able to render better service as a result of it.

Second. Especially would I like to call your attention to the service that is given you in our Monthly Review. Under the able management of our esteemed editor, Mr. Richards, it comes to us each month replete with what he can gather from all sources of the latest and best in electro-plating ideas, news of the branch societies, and sometimes, when he can't get anything else to print, poetry. And even the poetry has a kick in it, but never a knock. But I would have you realize that Mr. Richards is only the editor and that really the ones who are responsible for the "Review" and its continued appearance each month, are you men who look forward to its arrival. It is possible to increase the value and usefulness of the "Review" and its value and usefulness will be increased just in proportion as we as owners and associate editors, if you please, get behind it and boost it by sending in material for its pages. Each one of you has information and knowledge of our profession of value to all the rest. Send it in and give our editor the chance to make the "Review" something to look forward to with greater pleasure and profit each month. And don't hesitate because you may be afraid that the editor won't like it. He may break out into more poetry, but believe me, gentlemen, it will be a hymn of praise and thanksgiving.

Another thing that I would like to mention for your careful consideration, is the request of the United States Bureau of Standards for an appropriation from the Congress of $10,000 to be used for electro-plating research. This item has, we understand, been cut out of the Legislative Bill by the House Appropriation Committee and our only hope for getting this appropriation is by having it reinstated by the Senate Committee. This question has been discussed with some of the members of the Chicago Branch and I have appointed a committee to consider what action we can take to this end. This is a matter of vital interest to all of us and we should all stand ready to back up our committees' recommendations in the matter. Dr. Blum will give you the details of the matter, as he is in close touch with the question. Let's boost the game.

This also appears to me to be a good time to ask you if you have ever thought of what the future of electro-plating and electro-platers, too, would be if this society had never been organized. We can look back over the past ten years and can contrast the conditions prevailing at that time with those of the present. Every one of us realizes that an immense improvement has taken place in processes and methods and it has been accomplished largely by the thought and work of the members of this society. Every new process, method and material used has been placed at the disposal of all our members through the discussions and papers of our branch societies and our annual conventions, adding to our knowledge and usefulness and raising the standard of electro-plating from an empirical art to a profession. If the past ten years has brought us so far, how much further may we expect to be carried during the next ten years? Can you, or I, or any other foreman electro-plater, afford it not to be a member of the A. E. S. in the coming years? And this thought suggests that we who are now reaping the benefits of the past must place the society in a position where it can go forward and progress, meanwhile adding to our own knowledge and usefulness and becoming better citizens. To do this we need to grow, and to grow, we need new members. Now is a splendid time to start to build for the future.

The war so far as actual fighting is concerned is, we are led to believe, over. War is primarily a breaking down process, not only of one's adversarys' resources, but also of our own. During a war many activities, civic, industrial, and social, must be curtailed or abandoned because at such a time every man's first duty is to the state and nation. War first, business second; if there is any time left for business. After the war is ended there necessarily comes on the part of all concerned, a period of reconstruction to recreate and rebuild the resources wasted and dissipated during its continuance. We hear and read a great deal about the plans for reconstruction, both in this country and in Europe at this time, and the thought suggests itself that if it is a good thing for the nations of the world to take stock of themselves, as it were, at this time, and to plan to rebuild and restore the waste of war, it is also a very good thing for the various units and organizations engaged in any line of endeavor, and especially of those whose aim and purpose is the betterment of mankind in any manner, to plan to rebuild their organization, to recover the waste of members due to war demands and to infuse new life and energy into their organizations by building up the membership. The A. E. S. has had in company with all other societies a certain loss in membership, due to the call for active service and the intense strain on the individual member due to industrial demands, which left many with little energy and less time to devote to society matters.

It is the opinion of every member of this society who gives the question serious thought, we believe, that the society, as a result of the war, finds that its existence is more than justified; the help it has been to the individual member who brought up his daily problems for discussion and solution; the material assistance which it brought to the war industries by virtue of such service and the increase of the knowledge of our profession, due to our association with one another, under such conditions will be a benefit which will be felt for years to come. If this be good for us it is also good for the other fellow who needs this help and service, even as we ourselves needed it. To grow we need this help, his contribution of knowledge, his fellowship, even as he needs ours. We recommend, therefore that every branch society and every member, with the realization that unless we advance we go backward, make a special effort this year to build up the society by building up the membership of their branch through the selection of the best material in their territory, remembering always that quality, not quantity, is desired.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

WILLIAM J. REARDON

William J. Reardon, the subject of this sketch, needs no introduction of THE METAL INDUSTRY readers of a few years standing. To our newer readers, however, it will only be necessary to state that Mr. Reardon is one of the foremost practical foundrymen engaged in the metallurgical work connected with the metal foundry.

WILLIAM J. REARDON.

Mr. Reardon has favored THE METAL INDUSTRY, from time to time, with exceptionally interesting and valuable recitals of his experiences gathered during a long and busy life. Mr. Reardon, in the opening article of this issue of THE METAL INDUSTRY, gives a very clear picture of himself by his method of describing his trials and troubles in overcoming the tremendous task put before him in the manufacture of copper driving bands. Mr. Reardon was connected with the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa., for upward of fifteen years as superintendent of the brass foundry, smelting and die casting departments, and during this time he developed many new methods of brass and copper melting, namely: cast-on resistance copper and brass rings, copper castings in permanent moulds, thereby eleminating excess gates and risers and many other features which he has always consented to give to the trade for the asking. He also developed a very efficient time melting and temperature pouring system that was productive of saving many thousands of dollars in defective castings and labor.

In addition to his brass foundry experience he is thoroughly at home in the smelting of all non-ferrous metals, and installed and operated a large scrap reclaiming plant to refine and re-use all grades of non-ferrous scrap metals produced by the Westinghouse Electric and Manufacturing Company. Mr. Reardon supervised and improved the manufacture of all the babbitt and solder used by the Westinghouse Company, and which grades are known as the best, which fact speaks for itself in regard to Mr. Reardon's ability in the manufacture of babbitts and solders.

In April, 1916, Mr. Reardon left Pittsburgh and went to Rome to take the superintendency of the casting department of the Rome Locomotive and Machine Works, which has since become a part of the Rome Manufacturing Company. His experience during the past three years are summed up in his article on "The Manufacture of Copper Driving Bands," mentioned above. He terminated his connection with this company on January 31, 1919, and has now become identified with the Aluminum Castings Company, of Detroit, Mich., and readers of THE METAL INDUSTRY may be assured that they will shortly hear from him in regard to his new work.

Walter A. Boice, John G. Collins and **Thomas W. Minnaugh,** who were associated with W. J. Reardon at the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa., and at the Rome Locomotive and Machine Works, Rome, N. Y., are expected to accompany Mr. Reardon to Detroit, Mich., and be associated with him at the plant of the Aluminum Casting Company.

A. R. Watson, a lawyer, with offices at 165 Broadway, New York, was elected president of the Balbach Smelting and Refining Company, Newark, N. J., the first week of January.

THE "HOWARD EVANS" LAUNCHED

The first launching of the New Year was the barge "Howard Evans," at the shipbuilding plant of E. J. Tull, Pocomoke City, Md., on January 1, 1919.

HOWARD EVANS.

The launching party arrived at the High Tide, via special train, from Philadelphia. Miss Sarah A. Brown, daughter of the late Benjamin H. Brown, former city treasurer of Philadelphia, broke a bottle of the vintage of 1899 against the sturdy bow as the boat gracefully took the waves of the historic Chesapeake.

The new barge carries 1,000 tons dead weight, 190 feet long, 23 feet beam and 12-foot hold. She carries supplies and equipment to the foundries and shipbuilding plants along the coast, the Delaware River, New York and Boston. She is one of the fleet of twenty steam towing boats and barges owned by the Diamond P. Boat Line, whose office is located at Pier No. 45, North Philadelphia, Pa.

Mr. Howard Evans is the first vice-president of the J. W. Paxson Company, Philadelphia, Pa., manufacturers and dealers in foundry supplies, who are large owners in the above line. He is also president of the Penn Facing Mills Company, life member of the Union League of Philadelphia and a member of the Manufacturers' and Philadelphia Country clubs. Captain James L. Crawford, marine superintendent, is well and favorably known in shipping circles.

G. J. Keller is now connected with the Pittsburgh, Pa., office of the Knox-Anderson Company. This concern is distributor of production machinery and tools and district distributor for Keller pneumatic tools, Van Dorn electric tools, Hannifin chucking equipment, Kelly reamer and Hoefer multiple heads. Mr. Keller is an old metal man, well known to the trade, and he will be well remembered as having been connected first with the Bunting Brass and Bronze Company, Toledo, Ohio, and then with the Johnson Bronze Company, New Castle, Pa., and more recently as foreman for the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.

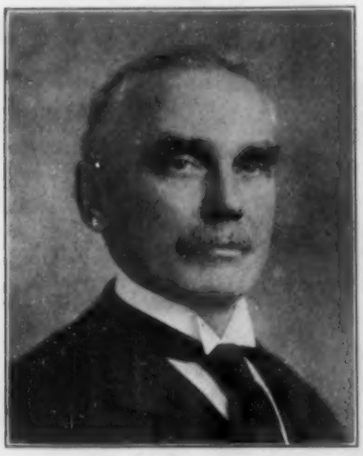
L. G. Kibbe, formerly president of the Turner & Seymour Manufacturing Company, Torrington, Conn., has resigned as general manager of the Stamford Rolling Mills Company of Stamford, Conn., and will take a rest of a month or two before deciding upon his plans for the future. Mr. Kibbe was stricken several weeks ago with influenza and so far has not recovered his former health and vigor. He plans to go to Texas for rest and recuperation. Mr. Kibbe went from Torrington to Stamford about a year ago.

Captain deCourcy Browne, Ordnance Department, United States of America, expects to return to the United States in the near future, and will be located at the Engineers' Club, 32 West 40th street, New York City.

DEATHS

DAVID R. DALY

David R. Daly, president and general manager of J. H. Gautier & Company, of Jersey City, N. J., passed away Monday, February 3, at West Milford, N. J., after an illness of almost two years. Mr. Daly was born at Piermont, N. Y., in 1853, coming to Jersey City a small boy. He was educated in the public schools of the city and at Cooper Union, New York. He entered the employ of J. H. Gautier & Company at a young age, and had been connected with the company for over fifty years, being the president and general manager at the time of his death. He was well known and highly respected throughout the metal industry for his genial disposition and strict integrity.



DAVID R. DALY.

He was always deeply interested in the administration of the city's affairs and held many public offices. He was at one time president of the Chamber of Commerce and for several years a director of the Board of Education. He was vice-president of the Hudson County National Bank and a trustee of the Provident Institution for Savings in Jersey City, a director in the Home of the Homeless, an institution for friendless children, and a director of the Old Dominion Steamship Company. He belonged to the Lodge of the Temple No. 110, F. & A. M., and to the Downtown Union League, Palma, and Carteret clubs, to the Historical Society of New Jersey, and also to the American Gas Association, American Institute of Metals, Illuminating Engineering Society, New York Railway Club and the Central Railway Club.

He is survived by a widow, two daughters and one son.

MICHAEL F. WARD

Michael F. Ward, of the Metropolitan district sales force of The Hanson & Van Winkle Company, Newark, N. J., died at his home, 376 Fifth avenue, Brooklyn, on January 7, after a very short illness.

MICHAEL F. WARD.

He was 52 years old, and was connected with the electro-plating industry for many years.

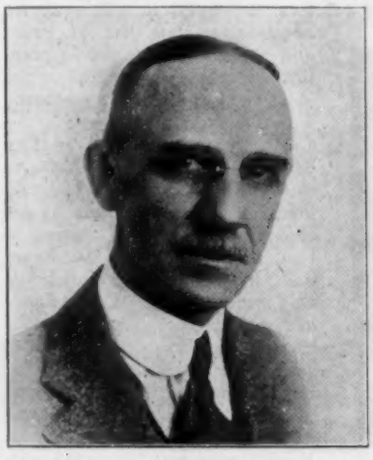
Mr. Ward was an all-round electro-plater of wide experience and has held positions with a number of large and well-known houses, chiefly in cities near to his home town.

He also was a member of the New York Branch of the American Electro Platers' Society.

About two years ago he joined the sales force of the Hanson & Van Winkle Company, which position he filled to the utmost satisfaction of his employers. Mr. Ward's kindly disposition and affable manner won him a great number of friends.

JOHN A. FLETCHER

John A. Fletcher, president of the Sterling Sales Company, Auburn, Ind., died at Garrett, Ind., on January 31, 1919. Mr. Fletcher was born in Edinburgh, Scotland, in 1858, and a few years later his parents brought him to America. He lost his father, who was an officer in the Northern army during the Civil War, and his mother died a short time later, and at the age of eight he was left alone in the world.



JOHN A. FLETCHER.

Mr. Fletcher held executive positions with some of the largest brass plants in America, and is well known to both eastern and western foundrymen as a metallurgist and efficiency expert. Later in life he experimented considerably with nickel, and worked out some very valuable alloys. In 1917 he was instrumental in organizing the Sterling Sales Company at Auburn, Ind., for the purpose of casting and rolling a very remarkable alloy of nickel, copper and zinc, which he copyrighted "Sterlite," and was its active president until his death.

Mr. Fletcher contracted influenza while East on a business trip and returned to his home in Auburn, Ind., on December 24, in a very critical condition. After almost a month of illness he was taken to a nearby hospital in hopes that he could recover, but complications set in and death came a few days later. He is survived by a widow and two children, John A. Fletcher, who is in the service, and Mrs. R. V. Hutchinson.

CORNELIUS TRACY

Ex-Senator Cornelius Tracy, president of the Waterbury Rolling Mills Company, Waterbury, Conn., died at his home in that city of apoplexy on January 24. Mr. Tracy was 65 years old and had lived in Waterbury since he was 17 years old. In 1886 he became associated in the lumber business with his brothers under the name of Tracy Brothers Company, and at the time of his death was still treasurer. This firm has contracted for and erected many important buildings, including schools, churches, factories and business blocks, in various places; some of these being the state building at the World's Fair in Chicago, in 1893; the Courthouse in Danbury, and the State eformatory in Cheshire. He leave a widow and two sons, Howard F. and Edward B., all of Waterbury.

LEWIS A. PLATT

Lewis A. Platt, president of Platt Brothers & Company and treasurer of the Patent Button Company, both of Waterbury, Conn., died at Miami, Fla., January 24, at the age of 64.

Lewis A. Platt was born in the section of the city known as Platts Mills on May 31, 1854, and was the son of Clark M. and Amelia (Lewis) Platt, and grandson of Alfred Platt, the first man in Waterbury who manufactured brass and copper wire.

Mr. Platt graduated from Yale University in 1879 and then he entered the factory of the Platt Brothers & Company, and worked his way upward through all branches of the business. When his father became president of the company he became its secretary, continuing in this office until his father's death on December 20, 1910. He then succeeded to the presidency and had since been the directing head of the business.

CHARLES A. HAMILTON

Charles A. Hamilton, a former resident and prominent citizen of Waterbury, Conn., died January 22 at his home, 431 West End avenue, New York, of arterio sclerosis.

Charles Alfred Hamilton was the son of Captain D. B. and Mary (Rogers) Hamilton and was born in Albany, N. Y., March 3, 1849. He spent most of his boyhood in Hartford, and was educated in the schools of that city, including the high school.

When about 17 years of age he went to Waterbury and entered the employ of Rogers & Brother. He soon became their chief traveling salesman and attained success in that position. At the beginning of 1886 he withdrew from this concern to organize the Rogers & Hamilton Company, of which he was made president. On the reorganization of the Bridgeport Brass Company Mr. Hamilton was made a director in it. When Col. Frederick A. Mason, on account of failing health, retired from active connection with that company, Mr. Hamilton became the acting treasurer, and on July 1, 1890, was appointed treasurer and held the office until January, 1895. When the International Silver Company took over the silver plants with which he was connected, he become vice-president and member of the executive board, which offices he held until recently, when he resigned on account of failing health.

He married Miss Burgoyne, of New York, on March 20, 1879. She and their son, Captain Burgoyne Hamilton, survive him. He also leaves a sister, Miss Katherine Hamilton, and a brother, Paul Hamilton, both of this city.

Franklin F. Weston, employment manager for the Torrington Company, died January 8, at his home in Torrington, Conn., after a long illness. Mr. Weston was born in Torrington, Jan. 18, 1868, a son of E. F. Weston, who was for 26 years superintendent of the Union Hardware plant. Prior to becoming employment manager for the Torrington Company, Mr. Weston was for many years a traveling salesman. He resided for a short time in Elmira, N. Y., and later in Passaic, N. J. His wife, one son, Lieutenant Franklin Weston; his mother, Mrs. C. L. Weston of Torrington; and one brother, Frederick P. Weston of the Torrington Company, survive.

John H. Savage, Jr., vice-president and treasurer of the Cleveland Electro-Metals Company, Cleveland, Ohio, died on January 16 of influenza after a six-days' illness. He was widely known in his particular branch of the industry, and a remarkable future was promised for him. He was only 28 years old. Mr. Savage was also prominent in local club life. He came to Cleveland from Wisconsin five years ago after a course at the University of Wisconsin. He was also a graduate of Williams College.

William C. Bruce, president of the Bowler Foundry Company, Cleveland, Ohio, died at his home in Shaker Heights after several years' illness. Before he was forced to give up active business, Mr. Bruce was head of the Bruce-McBeth Engine Company, the Union Steel Screw Company, and the W. W. Sly Manufacturing Company.

Emile A. Stotter, who recently organized the Cleveland Smelting & Refining Company, Cleveland, died December 9 from influenza after a brief illness. His death occurred five days after that of his wife, from the same disease. He was formerly treasurer of the Lake Erie Smelting & Refining Company, and had been associated with the brass and copper industry in Cleveland for a number of years.

Clarence A. Cook, president and agent of the Taunton-New Bedford Copper Company, New Bedford, Mass., died January 1, 1919.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

The will of ex-Senator Cornelius Tracy was probated February 1 without contest. Included in the bequests are 25 shares of Waterbury Rolling Mills Company stock to a son, Edward Bronson Tracy. The will states in connection with these 25 shares that they are given with the hope that the son will take up the brass business as a life occupation. It suggests that the son take employment with the company in due time.

Mr. Tracy advised his children to be charitable and to take an interest in affairs of public welfare.

At the annual meeting of the Waterbury Farrel Foundry and Machine Company the following officers were chosen: President and treasurer, W. S. Fulton; vice-president, P. F. Bannon; secretary, D. C. Griggs.

The public will notice the omission of the name of W. E. Fulton from the list of officers. The explanation is that Mr. Fulton has decided to have a well-earned rest, and the labors that come to the head of such a concern have been transferred to his son, William Shirley Fulton, who has been associated with his father for many years. Mr. Fulton has been a resident of Waterbury since 1873. He started as assistant bookkeeper for the Holmes, Booth and Haydens Company. He remained there for four years and became bookkeeper for the Farrel Foundry and Machine Company in January, 1877 and continued with the plant ever since. After the death of the late E. C Lewis on October 24, 1901, Mr. Fulton succeeded him as president.—C. F.

TORRINGTON, CONN.

FEBRUARY 10, 1919.

Valuations of Torrington's metal products plants as given in the new town grand list just compiled by the assessors are as follows: American Brass Company, $3,052,619; Turner & Seymour Manufacturing Company, $257,743; Torrington Manufacturing Company, $245,300; Torrington Company (Excelsior plant, $783,549; Progressive plant, $99,000, and Standard plant, $432,730), total $1,315,279; Fitzgerald Manufacturing Company, $27,200; Union Hardware Company, $713,812; Schroeder Brothers Manufacturing Company, $7,405; Hendey Machine Company, $674,180.

Among the annual reports filed during the month with the town clerk were the following:

Turner & Seymour Manufacturing Company—President, Charles F. Brooker of Ansonia; vice-president, John A. Coe of Waterbury; treasurer, F. H. Griffiths; secretary, Henry S. Washburn; assistant secretary, W. W. Cotter. Directors, Charles F. Brooker, John A. Coe, John P. Elton, Edward L. Frisbie, Thomas W. Bryant, Frank M. Travis, F. H. Griffiths, W. W. Cotter and Edward H. Green. The last named is of New York.

Torrington Manufacturing Company—President, James A. Doughty; vice-president, Robert C. Swayze; treasurer, Frank M. Mathews; secretary, Henry G. Ellis; assistant secretary, Robert C. Swayze. Directors, James A. Doughty, L. G. Turner, George H. Braman, Wadsworth Doster and Robert C. Swayze.

Factories in many of the smaller towns throughout New England are solving the post-war problems and readjusting their conditions fully as effectively, if not more so, than their rivals in the larger towns and cities. W. S. Rogers, chairman of the executive board of the Bantam Anti-Friction Company at Bantam, Conn., one of the largest metal products plants in Litchfield County, outside of Torrington, prepared the following statement for a representative of THE METAL INDUSTRY:

"Answering your first question as to what our plant has done to help win the war would say that we were on a 100% war basis, refusing all orders that did not have a Government number, and we ran full time, overtime and some more time.

"As to what we are doing to change from a war to a peace basis would say that we changed over the day the armistice was signed, and are now on a 100% peace basis, as we began

to prepare six months before the armistice for the conditions that we knew would occur should the armistice be signed or peace come quickly.

"As to what we have done to aid the soldiers who are returning home would say that our factory has taken nearly $70,000 worth of Liberty Bonds which for a little plant of one hundred men we think you will say is doing first rate. We are also 100% Red Cross, and 100% all other services.

"We are the only factory in New England so far as can be discovered that has a complete, up-to-date theatre for vaudeville and moving pictures, right in the midst of our factory, for our employes, with a reading, lunch and recreation room combined, and also we are the only concern that we know of anywhere that is coupled up with the moving picture corporations for regular schedules of performances of the bright stars in moviedom, such as Mary Pickford, Charlie Chaplin, Arbuckle and the other bright lights on a yearly contract basis with the very best moving picture film corporations, all of which is exclusively for our employes and their families, and all of which is operated, controlled and directed completely by the employes themselves, the company simply O. K.-ing the bills and paying them."—J. H. T.

NEW BRITAIN, CONN.

FEBRUARY 10, 1919.

With the exception of the Rockwell-Drake plant of the Marlin Rockwell Corporation, where there has been a strike in progress for several weeks, the general labor condition in this vicinity is excellent and, according to the report of the United States Employment Service, is continually improving. Particularly in New Britain, there has, as yet, been no indication that the various concerns had employed the maximum number of hands and there have been no complaints from any of the returning soldiers or sailors, or from others, that they cannot find work. From the business point of view conditions here are probably better than in many of the cities where big war contracts have made up the chief business for the past four years. While hundreds of thousands of dollars have been lost here by the cancellation of unfinished war orders, the normal output of the concerns is such that there is a steady and ever increasing demand for their products.

During the past month all of the war contracts at the Russell & Erwin division of the American Hardware Corporation have been cancelled, necessitating the laying off of a large number of hands, mostly inspectors. The policy of the factory, however, as is the case with other local concerns affected similarly, is to replace these people in other parts of the factory. The New Britain Machine Company has naturally lost considerable work by the Government cancellation progress, but is still quite busy. The North & Judd Manufacturing Company is also having plenty of work and the Traut & Hine Manufacturing Company has yet to feel the pruning shears at Washington. It is said at this plant that the nature of the Government orders is such that, war or peace, the products are needed. In addition to its line of stock goods, this concern is about to take over the manufacture of several important specialties which, when they are put on the market, are expected to create a new demand.

The various branches of the American Hardware Corporation, particularly the P. & F. Corbin division, are experiencing but little difficulty in the transition from war to a peace basis and there is no sign of any let-up in the work. This factory, like many others, is aiming to develop and maintain a brisk South American trade. With added business on the southern continent, the demand that will necessarily come from Europe, and the demand for builders' hardware and equipment that is expected right here in this country, New Britain manufacturers are not at all worried about the future.

The Landers, Frary & Clark Company, which has been operating a branch in Lancaster, Pa., has now closed that plant as a result of the advent of peace, and will not operate it for the present. This concern is just as rushed with peace orders for pocket knives, table cutlery, culinary articles, electrical ware and numerous other household utensils so that no new era of prosperity has to be awaited there. The company, a few months ago, bought an additional factory in Meriden which it continues to operate and where it now intends to make some improvements. The Stanley Works, with its output of wrought steel and bronze butts and hinges and cold rolled steel, is doing an excellent business, and the Fafnir Bearing Company, Hart & Hutchinson and Hart & Cooley plants are also busy. Business is also picking up at the Stanley Rule & Level Company, where builders' tools of all kinds are made.—H. R. J.

PROVIDENCE, R. I.

FEBRUARY 10, 1919.

The manufacturing jewelers of this city and vicinity, of whom there are approximately 275 concerns, have already taken action in regards to the 48-hour week. At a recent special meeting of the corporation of the New England Manufacturing Jewelers' and Silversmiths' Association the matter came to a vote and while the association voted not to endorse the movement for the establishment of the 48-hour week, it was agreed that each manufacturer should be free to act individually and independently. Several of the large concerns have already announced the establishment of the new schedule and others have stated dates on which they will put it into effect and it is believed that before the end of the first six month of 1919 all the manufacturing jewelry establishments will be operating on a 48-hour basis.

The labor situation generally in the metal lines shows a somewhat changed condition from that which has been in vogue here for the past four years, up to within a comparatively few weeks, or, to be more exact since the signing of the armistice on November 11.

With business conditions such as they are, the metal lines, in common with many others, are not having enough orders to keep their plants running full time and consequently are not taking on any additional help. The returning of men who have been in service in the army or navy has created a situation that the manufacturers are finding considerable difficulty in meeting. But, as a general thing all such men are being placed in their old positions, or others equally as good.

At the annual meeting of the Manufacturing Jewelers' Board of Trade held last month, the following were elected as members of the board of directors, to serve for three years: Henry Wolcott, of Wolcott Manufacturing Company; Frederick V. Kennon, of John T. Mauran Manufacturing Company; J. Henry A. Moultrop, of H. C. Lindol & Company; Henry G. Thresher, of Waite-Thresher Company, and William T. Chase, of C. H. Cooke Company, all of Providence; Joseph Finberg, of J. Finberg Manufacturing Company, Attleboro; Frederick E. Sturdy, Jr., of J. F. Sturdy's Sons Company, and George A. Whiting, of Sturtevant-Whiting Company, North Attleboro. The directors met a week later and elected officers as follows: President, Frederick A. Ballou, of B. A. Ballou & Company, Inc., Providence; vice-presidents, William P. Chapin, of Chapin & Hollister Company, Providence, and Maurice J. Baer, of the Attleboro Manufacturing Company, Attleboro; secretary-treasurer, Horace M. Peck, of Providence; executive committee, the president and Frederick D. Carr, of the Ostby & Barton Company, Providence, and Henry Wolcott, of Wolcott Manufacturing Company, Providence.

The machinery in the Rocky Brook mill, South Kingstown, is being taken out the property having been purchased by a Providence syndicate which intends to manufacture tin cans. The mill was recently completed and it is understood that the new venture will be under way in a short time.

The French Ivory and Metal Company, incorporated under the laws of Rhode Island, received a charter through the office of the Secretary of State a few days ago, to engage in the business of manufacturing and selling ivory and celluloid. The firm has a capital stock of $10,000 and will be located in this city, the incorporators being Hugo Manovill, William B. Sherman and John I. Devlin.

The Providence Coppersmithing Company, Louis G. Schwab, proprietor, 56 Point street, has broken ground for the erection of its new building, 511 Eddy street. The building will be two stories, of brick, 40 by 70 feet, and will be occupied as a workshop. It is to be thoroughly equipped throughout with the latest machinery.—W. H. M.

ROCHESTER, N. Y.

FEBRUARY 10, 1919.

Rochester manufacturers are looking forward to a year of tremendous activity, despite reported conditions that under ordi-

nary circumstances would tend to create a pessimistic view Gradually matters are taking shape and adjusting to the spirit of the times. The larger permanent industries are running at top speed, and many of them are taking on additional help from time to time. Such big concerns as the Eastman Kodak Company has not only made every provision for the re-employment of returning soldiers who were in its employ, but is planning to add more to the already immense pay-roll.

The general let-up of work in the munition plants in Rochester —and there were six or seven of them—created a feeling of apprehension for a time. The release of from 3,000 to 6,000 working men and women from these plants was not altogether a pleasant picture to gaze upon. Hundreds, however, were temporary citizens of Rochester, having been attracted to the city from nearby towns and villages by the attractive war-time wages paid. These will all filter back to the places from which they came. Scores and scores of others, who left other places of employment in the city, will gradually find themselves earning a livelihood at their old trade or a new one. The advent of a 44-hour week and three new clothing manufactories here will take care of hundreds of unemployed from munition plants.

Inquiry at the principal plants of the city indicate that an immense amount of new business is springing up about Rochester. Shipping facilities in and out of the city continues to improve, and the railroads are apparently now caring for big business as well as just prior to the war. Deliveries of raw materials are excellent, so it is claimed.

Because of the steady growth of Rochester's population and the expansion of her industrial activity, it is anticipated that sooner or later one or more of the big buildings, recently used by cannon or shell plants, will be occupied by wholesale metal concerns as warehouse or storage houses. There is not a big wholesale metal supply house in this city—that is, one where all sizes and shapes of metals desired by local industrial plants can be obtained. Buffalo has such an establishment, while Rochester manufacturers must order from there or some distant point when desiring certain shapes.

The Atlantic Stamping Company has announced that additions and alterations in its Ames street plant will soon be begun to enable it to take care of the greatly increased business coming from South American countries. The company has been engaged in war work during the past year.

For three months or more past reports have been in circulation to the effect a new tractor manufacturing company was about to establish itself in Rochester. The vacant buildings and grounds of the Symington-Anderson Company and Crowther Manufacturing Company are said to have been selected and leases for the plants have about been concluded. The former building was used as a shell plant. The other was an automobile factory. Men having stock in the Ford Automobile Company will dominate the new concerns. The chief product of the new plant will be a tractor adapted to what is known as the one-man farm, and will retail at $400. The plant is located at the city line in Greece township, and is expected to furnish employment for 1,000 men.—G. B. E.

ROME, N. Y.

FEBRUARY 10, 1919.

The high tension, feverish activity that prevailed in the metal industries of this city during the progress of the war is gradually relaxing and business is beginning to assume a normal status. There has been no wholesale laying off of workers here, and this is generally attributed to the fact that Rome has had no exclusively war-time industries. Indeed, no such situation is likely to develop in Rome, for the reason that orders for the ordinary run of production are already in hand and prospects for future orders are reported to be bright.

An outstanding feature of the situation here is that the metal industries of this city are most favorably situated as regards shipping facilities. The city is located in the heart of the Empire State and is on the main line of the New York Central Railroad and the new barge canal, thus affording exceptional rail and water transportation advantages for both raw material and finished products. One-tenth of all the copper used in the United States is manufactured in this city.

In normal times upwards of fifty carloads of freight are sent from Rome every day to all parts of the country and to the seaboard for shipment all over the world. Freight is expeditiously handled here, assuring prompt delivery to the trade. Thus, with the return of normal manufacturing conditions in this city and country, the metal industries of Rome anticipate even a greater volume of business than they enjoyed before the war

As an instance of the optimism that prevails here, the fact may be cited that the Rome Chamber of Commerce, through the well directed efforts of its president, Frank J. DeBisschop, also president and general manager of the Rome Hollow Wire & Tube Company, and the Chamber's secretary, Lester C. Bush, the organization has just closed a campaign for members which resulted in a one hundred per cent. increase in the membership.

It may be said that the leading men in the metal industries of this city agree quite generally with Secretary of Labor William B. Wilson, who, in a recent statement, said: "Confidence is all we need to insure prosperity. If business men will get their business going and if we tide ourselves carefully over this brief period of readjustment, this country is going to know a prosperity as great as any she ever enjoyed."

At the annual meeting of the stockholders of the Rome Wire Company, recently held, the following directors were elected for the ensuing year: A. F. Carpenter, J. H. Dyett, T. Harvey Ferris, H. W. Barnard, H. T. Dyett, F. M. Potter, C. R. Keeney, P. C. Thomas and S. H. P. Pell, and at a subsequent meeting of the directors the following officers were chosen for the year of 1919: President, H. T. Dyett; vice-president, F. M. Potter; treasurer, H. W. Barnard; secretary and assistant treasurer, C. R. Keeney.

At the annual meeting of the Electric Rod Mill, Inc., also recently held, the following officers were chosen for the ensuing year: President, H. T. Dyett; vice-president, F. M. Potter; secretary and treasurer, C. R. Keeney.

The annual meeting of the Rome Brass & Copper Company took place on January 28, and the following directors were elected: Joseph Read, Willey L. Kingsley, William Pierrpont White, Robert F. Hubbard, Barton Haselton, Franklin A. Ethridge, Jesse J. Armstrong, Watkyn W. Parry and Herbert T. Dyett. The directors selected for officers the following: President, W. L. Kingsley; vice-president, treasurer and general manager, Barton Haselton; assistant treasurer, N. F. Thomas; secretary, J. J. Armstrong; assistant secretary and sales manager, H. J. Rowland; executive committee, W. L. Kingsley, Barton Haselton, F. A. Ethridge and H. T. Dyett.

The annual election of directors and officers of the Rome Hollow Wire & Tube Company was held on the same day as that of the Rome Brass & Copper Company and resulted as follows: Directors, F. J. DeBisschop, James A. Spargo, Barton Haselton, Hon. J. D. McMahon and F. M. Shelley. The directors, in turn, elected the following officers: President and general manager, Frank J. DeBisschop; vice-president, James A. Spargo; secretary and treasurer, F. M. Shelley.

The Rome-Turney Radiator Company will have the following directors for the ensuing year: Dr. W. L. Kingsley, G. G. Clarabut, Barton Haselton, George W. Turney and W. L. Lynch. The newly elected officers are: President, Dr. W. L. Kingsley; vice-president, Barton Haselton; treasurer and general manager, George W. Turney; secretary, W. L. Lynch; assistant secretary, Harry W. Gerwig. The election took place in the company's office on January 29.—M. J. D.

MONTREAL, CAN.

FEBRUARY 10, 1919.

With the first month of the year now past, conditions among many Montreal metal manufacturing plants are fairly bright.

While the industries here have taken part in large war orders, their equipment and business methods have been kept up to the full limit and they are therefore back again on ordinary peace-time business.

The railroad companies are making inquiries for brass goods and other lines for delivery this spring.

New developments of interest are transpiring this month in scrap metals.

Dealers seem to be well stocked and the low basis which has been named for prices may hold until some activity is manifested one way or the other. For instance, one shop sold a car of copper band turnings for 16 cents per pound early this month. Today they could hardly expect to get 14 cents per pound. The

16 cents was paid because the party making the purchase had a contract that had to be filled or the order would be cancelled.

As the British Government has now lifted the ban on many articles of export metal, manufacturers are girding up their loins for renewed competition.

In the matter of cutlery the United States manufacturers who had to meet such a stiff competitive trade from England during peace times had untrammeled sway in their own markets while the war was in progress. Now, however, cutlery has been placed on the free list and English goods will be seen on the market again.

Building prospects which will call for plumbing brass goods looks promising this spring and will develop as the weather moderates.

The manufacturing jewelry business has enjoyed a good past year and the Henry Birks Manufacturing Company, located on Philips Square, have made some alterations and additions to their factory.

Montreal is to be well represented at the great International Fair at Lyons, France, this spring. The Canadian Manufacturers' Association has taken an active and energetic interest at this exposition, which has now taken the place of the big German Fair which was held at Leipsic before the war.

The Duncan Electrical Company, St. James street, large manufacturers of electrical goods, will exhibit a full line of their specialties at Lyons.

In the list of sixty Canadian exhibitors, Montreal will furnish ten corporations.—P. T. B.

CLEVELAND, OHIO

FEBRUARY 10, 1919.

Something of a waiting attitude has developed in the metal industry of this district in the last few weeks, not because members of this trade are averse to returning immediately to peace time producing conditions, but because a similar waiting attitude has developed in certain industries dependent upon this business. This condition is especially noted among machine tool manufacturers here, and probably is justified, in view of the fact that the Government, with a normal two years' supply of machines, material and equipment on hand, is no longer in the market for the huge quantities seemingly so necessary before the armistice was signed. But added to this, machine tool interests point out, is a normal two years' stock of standard machines already made up. The natural result is that this field is not in the market for materials entering into their production, and this is a large item with the metal industry. During the last few weeks this condition has been considerably offset here by the entrance into the market of large automobile interests, not only those producing cars and trucks in Cleveland, but Detroit, Toledo and other firms as well. These are speculating on bringing their production back to normal within a time varying from three months to only a few weeks. Whether these and similar interests will be in the market for equipment matters little, from the purely metal industry point of view, for it goes without saying that they will require materials anyway.

Another factor that the trade now has to reckon with is that of price. Practically all identified with this field, like those in other lines, are holding off on placing large orders, in the expectation that values will be lowered. As a matter of fact, nothing has developed in this connection in the last three months that would indicate a reaction from the war time schedule. Copper, brass, aluminum, antimony, nickel and other non-ferrous metals have actually advanced in price, and warehouse quotations are really above those named at the middle of November, or if they are not higher, they are at least stationary with the figures quoted at that time. The contention here is that the labor that has entered into the production of the raw materials is as high, if not higher, than it was at any time during the war period, and as all production in this and allied fields has been up to the maximum to meet the Government requirement for speedy output of finished product, there is considerable high priced material on hand right now.

The labor situation is adjusting itself more rapidly, from the employer point of view, than it was expected it would a month ago. More returning soldiers have been placed in their old positions with most firms, thus improving the efficiency of many departments. While there is no ground for lower wages at this time, and seemingly little disposition on the part of employers to cut wages, it must be admitted that there is now greater chance for better production in all lines of manufacture here, now that plants can be more discriminating in their selection of help.

This condition has given rise to rumors that many plants here will suspend operations. As a matter of fact not a single firm, as far as is known, large or small, has any such intention, although most establishments, in the last few weeks, have been closed for the inventory, stock taking and general overhauling period, and this condition in no instance has lasted more than a week. Such a condition is well illustrated by the statement issued by officials of the Aluminum Castings Company, in answer to rumors that the local and other plants of this firm were to close until sufficient number of domestic orders had been received. The statement says: "Our plants all over the country are closed, or partly closed, only for the inventory period. Far from business being slow, we find peace-time orders coming in more rapidly than we expected a few months ago. Automobile interests are buying more and more each day, and present indications are for full swing in industry by the end of February." This concern in Cleveland has been practically 100 per cent. on war work, and is now finishing up on this class of production. Officers state 75 per cent. of its force is being retained.

Following some slight changes in its organization, the Art Metal Manufacturing Company announced the election of E. L. Moore, for more than fifteen years in advertising work here, as secretary and treasurer of this concern. W. E. Cochrane is president, and Joseph Lenihan, vice-president. The changes involve the launching of an aggressive sales and advertising campaign, covering this concern's products, which include commercial, industrial and residence lighting fixtures.—C. C. C.

COLUMBUS, OHIO

FEBRUARY 10, 1919.

With the closing of hostilities and the readjustment of business metal prices in central Ohio territory are very unsettled. In fact it is difficult to get a quotation except from day to day. Prices are what the seller is willing to take and the buyer is willing to give. This state of affairs is noted in practically all of the metals dealt in Columbus and central Ohio.

Manufacturers and in fact all metal using concerns are now using up their reserve stocks of metals and are not buying except when absolutely necessary. Type metals are probably the strongest point in the market and there is some uncertainty in prices even in that line. Brass and copper are both weak and the same is true of aluminum. Spelter is only bought in small quantities and tin and zinc are also weak. In fact the market is in a waiting condition and there is little to bank on in the future.

Metal dealers believe that things will right themselves more or less promptly and that within a few months there will be more stability to the market. But in the meantime all are following the policy of buying only what is needed to take care of orders and not to stock up. As the country gets on a peace basis it is the belief that the demand for metals will gradually increase.

The Vulcan Welding Company, of Akron, has been chartered with a capital of $10,000 to do welding and brazing. The incorporators are Thomas J. Edwards, Sarah J. Edwards, David C. Fouser, Mary H. Fouser and Norvella M. Edwards.—J. W. L.

DETROIT, MICH.

FEBRUARY 10, 1919.

The automobile plants, which are the mainstay of Detroit at the present time, are pretty well along towards normal conditions after more than a year of intensive war work. None of them, however, are working near to capacity, with perhaps the exception of the Ford Company, the Cadillac and the Packard Motor Car Company. These great concerns carry about the same number of employees as they did before the war came to an end. All, however, report they are preparing for a great

production for 1919. The same also is reported for the Burroughs Adding Machine Company, which has one of the largest and most complete plating and enameling plants in the city. Most of the automobile concerns report more or less trouble getting steel. There is no further trouble regarding coal.

The city at present is crowded with returning soldiers. It is reported there are from 30,000 to 40,000 unemployed men here now. There have been practically no labor troubles and as fast as possible these unemployed soldiers are being placed. It is advisable, however, for job seekers to remain away from Detroit until spring or summer as the plants are all giving preference to native Detroiters when it comes to furnishing employment.

Present conditions are believed only temporary and plans are under way for expansion in the metal industries as soon as business conditions are more settled. Most everyone is very optimistic regarding the future, although the uncertainty seems to be very trying.

A great many metal concerns are more or less hit by cancellation of war contracts and a number it is said are making a great effort to get an early adjustment for supplies they had on hand and in which considerable of their ready capital is tied up.

The Detroit Copper & Brass Rolling mills has re-elected the following directors: Lewis H. Jones, Richard P. Joy, Arthur H. Buhl, Lawrence D. Buhl, F. H. Hecker, H. D. Sheldon, C. B. Davis. Officers: President and general manager, Lewis H. Jones; vice-presidents, Richard P. Joy and Arthur H. Buhl; secretary and treasurer, A. P. Peoples; assistant treasurer and assistant secretary, W. P. Bache; auditor, J. E. Workman; assistant general managers, J. P. Searles and Frank H. Hoffman; general superintendent, Alex Henderson.—F. J. H.

MILWAUKEE, WIS.

FEBRUARY 10, 1919.

There is considerable uneasiness among the metal industries of Milwaukee following the cessation of hostilities on European battlefields and the cancellation of war contracts by the Government. This uneasiness is felt chiefly among firms whose entire resources were concentrated on Government work in helping to win the war. When suddenly the armistice was signed and contracts cancelled, these firms had on hand thousands of dollars worth of business, a large part of which was partially completed. Just what is to become of these partially completed contracts is what is worrying the companies. There is nothing in the laws passed by Congress by which the companies have redress in claiming payment for such work from the Government. That does not mean, however, that they will not be paid for it, in the opinion of officials. It is felt that Congress will first have to pass necessary legislation before such claims can be paid and that will take several months. In the meantime, the firms are gradually emerging from their war time surroundings and re-establishing their output on a peace basis. This will take time, particularly with firms which have been doing only Government work and have put in the necessary machinery to do it with. On the other hand there is no great anxiety on the part of officials to rush contracts they secured while making war materials because of the high prices prevailing on raw goods. High wages are another obstacle to a speedy reconstruction program.—B. E. S.

PHILADELPHIA, PA.

FEBRUARY 10, 1919.

David Cramer has withdrawn his interest in the Southwark Smelting and Refining Company, 717 South 12th street. The business will be carried on by Morris Axelrod, under the old firm name. He is now the sole owner.

Announcement is made that the plant of the Philadelphia Brass Company, East Downing street, this city, will be sold at public auction on the premises at 11 o'clock, February 17. At the sale a complete equipment of a brass rod factory will be offered. This includes two rod drawing machines large excrution presses, and a complete machine shop outfit.

One-half of the building of the Hero Manufacturing Company, Adams and Gaul streets, has been leased to the Lowry Top and Body Company, 33rd and Walnut streets, manufacturers of auto tops and bodies. The Hero Company manufactures metal goods and during the war held large Government contracts for the manufacture of gas masks. With peace ruling the firm found little use for all of their present area.

The brass foundry of Louis Blumberg, 335 North 4th street, which was damaged by fire several weeks ago, is being repaired and the firm is prepared for an active business.

The National Electric Welding Company, of this city, has been incorporated with a capital of $50,000 to manufacture welding apparatus.

Thomas Devlin was re-elected president of the Philadelphia Foundrymen's Association at a meeting of the body in the Manufacturers' Club, Broad and Walnut streets, January 8. George C. Davis was again elected as vice-president with the other officers being treasurer, Josiah Thompson, and secretary, Howard Evans. Addresses were made by Staunton V. Peck and Walter P. Miller.

It is not generally known that the Government through the United States Mint will buy precious metals in lots which reach a value of $100 or more, but such is the case. A report issued early in the month shows that the Philadelphia mint has reduced jewelry and other articles gathered in melting pots into bullion valued at $7,000. Much more is to be assayed and valued.

The Abrasive Company, Tacony and Fraley streets, who manufacture grinding wheels and who are well known to the metal trades of this city, has just completed a one-story and frame storage building, 18 x 60 feet, at a cost of $400.—F. W. C.

TRENTON, N. J.

FEBRUARY 10, 1919.

The cancellation of war contracts by the United States Government has had little effect yet upon the metal industry plants of Trenton, and no great change is looked for at the present time. The only Trenton plant where the cessation of Government orders has shown bad results is the Jordan L. Mott works, where a number of employees have been laid off. Only some of the employees of the munitions department have thus far been laid off and others are being kept at work finishing up the order. Eventually the munitions department will be closed permanently and then more hands will then have to seek other employment. The Government has cancelled all war orders in the Trenton plants.

Although the Skillman Hardware Manufacturing Company has stopped making war material it will not lay off any help. William G. Wherry, president of the concern, says that he believes business is going to be very good in the spring: "Although our war orders have been stopped," he said, "we are not going to lay off any of our employees, and will find other work for them. Jobbers are beginning to buy and their orders are increasing. I am optimistic over the future and can see by the considerable buying at the present time that there will be plenty of building in the spring and summer." Mr. Wherry recently returned from an extended western trip and found prospects very good.

The Max Movsovitz Company, metal manufacturers, has branched out in the rendering business and has been granted a permit to build a plant adjoining its works along the Delaware River. The department foremen and office employees of the Mercer Autobomile Company held their annual banquet recently at the Trenton House. J. W. MacMorris, the new superintendent of the plant, was introduced to each employee by William T. White, president of the company. William A. Smith, secretary of the company; Percy Green, assistant treasurer, and Major A. C. Schultz, chief engineer of the plant, who was in the tank service of the United States, and R. M. Hillias, of the Whiting Motor Company, New York, spoke.

James Newell, employed for many years as a brassworker at the J. L. Mott plant, and who was injured while fighting overseas, died on a transport while being brought to this country to be sent to a convalescent hospital. Newell lived in the Broad Street Park section of Trenton, N. J.

Ferdinand W. Roebling, Jr., first vice-president of the John A. Roebling's Sons Company, is in a sanatorium in Philadelphia for a prolonged rest. He was stricken with a nervous breakdown and went south for several weeks. After returning he

was advised to go to a sanatorium. Mr. Roebling is one of the executors of his father's estate and also an executor of his uncle, Charles G. Roebling. Both manufacturers left estates valued at $40,000,000.

The Alloy Welding Products Company, of Jersey City, N. J., has been incorporated with $10,000 capital to operate brass foundries. The incorporators are William T. Kyle, Charles A. McCune and Joseph J. Hughes, all of New York.

Paramount Manufacturing Company, of Westfield, N. J., has been incorporated with $100,000 capital stock to manufacture and deal in metal goods. The incorporators are E. B. Steiner, of Westfield, and B. Steiner and David Wertreuch, of New York.

White Metal Manufacturing Company, of Jersey City, has been incorporated with $500,000 capital to manufacture and sell metal containers. The incorporators are Theodore Rurode, Theodore H. Smith and D. F. Edwards, all of Jersey City.

The Dexter Metal Manufacturing Company, of Camden, N. J., has awarded a contract to Milton W. Young, of Overbrook, for a one-story factory addition, 30 x 300 feet.

The Art Metal Works, of Newark, N. J., has leased the property of the Birkenhauer & Bauman Brewery at that place and will use the property for the storage of raw materials and finished products. The company is also considering an addition to the plant. The new property has an area of 60,000 square feet.—C. A. L.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

Seldner and Enequist, manufacturing chemists, 86-112 Hausman street, Brooklyn, N. Y., are putting up a plant for the grinding and polishing of zinc and copper sheets.

Due to a large increase in demand in New England for electrolyte and casting copper, **White & Brother,** of Philadelphia, Pa., have opened an office at Boston, Mass., 919 Oliver building, with Raymond Huatu in charge.

The Goldsmith Brothers Smelting & Refining Company, 29 East Madison street, Chicago, Ill., announces that at present it does not contemplate the erection of additional buildings to its plant at 5844 Throop street, as was recently reported.

The General Briquetting Company, Winton Place, Cincinnati, Ohio, expects to have its new plant in operation within the next two weeks. The company will briquette cast borings under a new process. All equipment has been purchased.

The Aluminum Castings Company, Buffalo, N. Y., report that the statement that it had filed building plans for enlarging its plant at Elmwood and Hertel avenues, is very misleading as the changes only represent minor improvements instead of enlargement.

The Aluminum Goods Manufacturing Company, Manitowoc, Wis., which presented each of its employees a free life insurance policy under the group plan several years ago, is continuing in force the policies of all men who enter the military service and do not leave the confines of the United States.

Fire recently destroyed the machine shop and foundry of **C. E. Babbitt,** 440 Fore street, Portland, Maine. The loss, including equipment and machinery, amounted to $20,000. Mr. Babbitt operated a brass and bronze foundry, machine shop, tool room, casting shop, and tinning and soldering department.

Due to constant growth of business and increase in organization, **Charles A. Anderson & Company,** chemical department, 120 Broadway, New York, has found it necessary to seek considerably larger quarters, and on February 1, 1919, moved to the fourth floor of the Lamborn building, 132 Front street, New York.

The Lober Radiator & Manufacturing Company, Toledo, Ohio, has been incorporated with a capital stock of $50,000 and will take over the Lober Art Brass and Specialty Company, 128 Eleventh street. The company has doubled its space and also its working force. The company operates spinning, stamping, brazing and soldering departments.

S. Blickman, 199 Lafayette street, New York, announces that the published report that they are having plans prepared for a reinforced-concrete plant to be constructed on property recently acquired at Long Island City and which is to be used for the manufacture of coffee urns and sheet-metal products, is entirely incorrect.

The McClean Machine & Tool Co., Ltd., Niagara Falls, Canada, have established themselves as consulting and mechanical engineers and builders of special automatic machinery and fine tools. They make a specialty of designing and building chain making machinery for both electric and fire welded chain, also fixture chain.

The Hamilton Metal Products Company, Hamilton, Ohio, has been incorporated with $30,000 capital stock and has absorbed the Hamilton Sheet Metal Company and the Schlichter Manufacturing Company. The company will engage chiefly in the manufacture of metal products and will also make hardware specialties, and will also have a tool room, brass machine shop, stamping and soldering departments.

The Quigley Furnace Specialties Company, New York, has opened a branch office in Providence, R. I., at 300 Turks Head building, in charge of F. W. Reisman, who has been the Quigley company's eastern New England representative for Hytempite (high temperature fire brick cement) and insulating brick, as well as the air transport system for distributing and burning powdered coal and other fuels.

THE METAL INDUSTRY recently had the pleasure of having a call from **R. Caballo-Saravia,** who has a small plating shop with a 25 ampere dynamo at Caracas, Venezuela. He was in New York getting equipment to increase the size of the dynamo to 200 amperes. Mr. Saravia looks forward to a better plating business in Caracas, believing that he will be able to plate some of the metal parts which for years have been finished outside of Venezuela.

The Grand Rapids Brass Company, manufacturers of hardware for the furniture trade, Grand Rapids, Mich., is contemplating the erection of a larger factory than the one it now owns and occupies. The discontinuance of the company's manufacturing business at Belding, Mich., calls for a larger plant in Grand Rapids. The company operates a brass, bronze and aluminum foundry, brass machine shop, tool and grinding room, plating, tinning and lacquering departments.

The Aluminum Goods Manufacturing Company, Manitowoc, Wis., has purchased two lots, 60x300 feet, adjacent to its works at Two Rivers, Wis., as a site for future extensions, and the company expects to have plans prepared for enlargement in a short time. The company operates a smelting and refining department, aluminum foundry, tool and grinding room, casting shop, rolling mill, cutting-up shop, spinning, stamping, polishing and lacquering departments. George Vitts is general manager.

The U. S. Copper Products Company, Cleveland, Ohio, announces that the construction of its building is progressing as the concrete foundation has been completed and the steel frame-work for the building is now being erected. The company has placed an order for three ten-ton electric traveling cranes, also an order for a billet piercing mill of the latest design, but reports that orders for draw benches, machine tools, motors, furnaces and foundry equipment are still un-

placed. The plant when completed will be equipped for the manufacture of copper and brass seamless tubing.

In order to take care of the increased demand for its products during the war, the **Sandusky Foundry & Machine Company,** Sandusky, Ohio, added to its foundry capacity a new building in which is located its increased melting equipment and special casting machines in which bronze tubes up to 30 inches in diameter and 20 feet in length are made. Additional machinery was installed in the machine shop for turning and boring these tubular shapes. The company reports that while the demand for bronze tubing for ordnance work and for auxiliary machines has fallen off, there has so far been no curtailment in the demand for tubing used in the shipbuilding industry. The company operates a brass and aluminum foundry, brass machine shop and casting shop.

The Badger Meter Manufacturing Company, 261-265 Third street, Milwaukee, Wis., manufacturers of water meters, has acquired the entire plant and equipment of the Christensen Engineering Company and after making alterations and improvements will take occupancy about February 1 or 10. The Christensen plant consists of three brick, steel and concrete buildings, namely, a machine shop, 83 x 144 feet, an assembling and erecting shop, 60 x 110 feet and a warehouse and office, 40 x 110 feet. It provides sufficient space to increase the output of the Badger Company about 400 per cent. The company intends to equip part of the assembling shop as a brass foundry and is now inquiring for equipment for delivery about March 1. J. J. Leach is president and general manager.

The American Pipe Bending Machine Company, with offices at 39 Pearl street, Boston, Mass., U. S. A., are about to open up pipe bending plants in all large cities throughout the country. The first plant is about ready for operation at Lowell, Mass. "Wonder" Pipe Benders, manufactured by this company, will be used at all plants for bending pipes of brass and copper as well as steel and iron. This company will make a specialty of furnishing bent pipe and make delivery of small orders in 48 hours' notice. Heretofore contractors and other users of bent pipe have had to wait from two weeks to three months to get deliveries. Each plant will have facilities for turning out from 1,000 to 3,000 bends per day, and will be in charge of an expert pipe bender. The present company was capitalized at $100,000; the old company is about to be reorganized with a capital of $1,000,000, to carry on this business.

INDUSTRIAL SERVICE

A course on the Human Side of Engineering, for colleges, has been outlined by Industrial Service Movement, 347 Madison Avenue, New York. It is designed to give instruction in: (1) Human factor in industry; (2) evolution of the individual worker; (3) influence of the modern factory system on the worker; (4) human factors in production, including working conditions, housings, savings, etc.; (5) ethics of engineering and business; (6) employment management, vocational guidance and the education of employees; (7) co-operative organizations; (8) legislation and public opinion on industrial questions; (9) programs of typical companies for effecting industrial betterments; (10) scientific management in its human relations; (11) handling intelligently of employees; (12) engineer's responsibility for service; (13) readjustment and reconstruction. Fred H. Rindge, Jr., is secretary of the organization.

ELECTION OF OFFICERS

At the annual meeting of the stockholders of the **Norwich Nickel and Brass Company,** Norwich, Conn., held January 14, the following board of directors was elected: William A. Aiken, Edwin A. Tracy, Alfred L. Aiken and Horace D. Tracy. At a subsequent meeting of the directors the following officers were elected: Edwin A. Tracy, president and treasurer, and Horace D. Tracy, secretary and assistant treasurer.

BUSINESS TROUBLES

James R. Haviland, referee in bankruptcy, has issued a notice that the real estate and personal property of the **Philadelphia Brass Company,** bankrupt, will be offered for sale at public auction at East Downington, Pa., February 17. The notice states that there are seventeen acres of land, encumbered with stone foundry buildings, railroad sidings, etc., and machinery of a completely equipped brass rod mill and foundry.

INCREASE IN CAPITAL STOCK

The Foster Brothers Manufacturing Company, Utica, N. Y., manufacturers of iron and brass beds, has increased its capital from $350,000 to $600,000.

The Buffalo Bronze Die Cast Corporation, Buffalo, N. Y., has increased its capital to $131,000 and has taken over the Kendall Foundry Company. The company manufactures a general line of brass, bronze and aluminum sand castings and specializes in die and chilled castings of aluminum bronze. Besides a brass, bronze and aluminum foundry the company operates as tool and grinding room and casting shop.

CHANGE IN FIRM NAME

The Syracuse Smelting Works, of Brooklyn, N. Y., Chicago, Ill., and Philadelphia, Pa., will hereafter conduct the sale of their products under the name of the parent company, United American Metals Corporation.

The name of the Warman Aluminum Casting Company, Cincinnati, Ohio, has been changed to the **Cincinnati Aluminum Casting Company.** The company operates a brass, bronze and aluminum foundry and grinding room.

The Wisconsin Metal Refining Company, Milwaukee, Wis., has changed its name to the **Wisconsin Brass Foundry Company** to better designate the present nature of its principal business. The plant is located at Fratney and Franklin streets, and N. A. Boehm is secretary and treasurer. The company operates a brass, bronze and aluminum foundry.

The Aluminum Sign Company, Kewaunee, Wis., has changed its firm name to the Leyse Aluminum Company, and has increased its capital stock from $75,000 to $200,000. The company is having plans prepared for an addition 60 x 120 feet, two stories and part basement, to be erected in the spring. When this addition is completed the company will broaden its line of products to include aluminum kitchen utensils and other goods, in addition to signs and novelties. The officers of the company are A. B. Leyse, president; Norman Leyse, secretary and treasurer.

AMERICAN BRASS COMPANY

Earnings of the **American Brass Company** for 1918 amounted to $3,992,320, compared to $7,109,177 for 1917. The December 31 last balance sheet shows cash $2,081,746, against $1,750,165 in 1917; bills receivable $692,819, against $776,882; accounts receivable, $7,530,534 against $7,501,594; accounts payable, $1,024,289, against $1,705,694; surplus $17,453,852, against $13,344,675; total assets $47,970,361, against $46,159,546. Dividends last year totalled $3,000,000, while for the year before they amounted to $6,675,000. Net profits in 1918 were equal to $20.73 per share on $15,000,000 capital stock, compared with $47.39 in 1917, and $72.66 per share in 1916.

At the annual meeting the following officers were elected for 1919:

Charles F. Brooker, Ansonia, president; Edward L. Frisbie, Thomas B. Kent and John A. Coe, vice-presidents; John P. Elton, vice-president and treasurer; Clifford F. Hollister,

assistant treasurer; Gordon W. Burnham, secretary; Franklin E. Weaver and Edmund H. Yates, assistant secretaries.

Directors: Charles F. Brooker, James H. Elton, Harris Whittemore, Arthur C. James, Gordon W. Burnham, Royall Victor, Edward Holbrook, Edward L. Frisbie, John P. Elton, Cleveland H. Dodge, Thomas B. Kent, T. Bramwell Burnham, John E. Wayland, James A. Doughty and John A. Coe.

RESTRICTIONS ON CHEMICALS

An important step toward a return to pre-war conditions in certain industries was to-day taken by Van. H. Manning, Director of the Bureau of Mines of the Department of the Interior, Washington, D. C., in modifying the restrictions recently placed on the manufacture and sale of fireworks and of chemicals used in the manufacture of explosives, and on the use of platinum, iridium and palladium in the manufacture of jewelry and for dental and other non-military purposes. Under the order as modified, licenses will no longer be required in connection with the handling of fireworks or the precious metals named. Many of the numerous chemical elements entering into the manufacture of explosives are used constantly for other commercial purposes, and under the new order no restrictions will obtain on the handling of these chemicals when not used in the manufacture of explosives. Licenses are still required for the handling of all such ingredients when intended to be used in explosives manufacture, however.

The explosives regulation act was passed by Congress in October, 1917, with the aim of putting a stop to the numerous incendiary explosions and fires occurring at war munitions plants and other industrial establishments. Under its terms, no one might sell, store or use explosives or ingredients entering into their manufacture without first obtaining a license from the Director of the Bureau of Mines.

The restrictions with regard to platinum, iridium and palladium were added some months later as a means of conserving the nation's limited supplies of these metals, which were essential to the manufacture of explosives and for other war needs, but which were being extensively used in the manufacture of jewelry and for other non-essential purposes.

GREAT BRITAIN BANS IMPORTS

The **War Trade Board** announces that it has been informed of changes of the import regulations of Great Britain. Great Britain finds it necessary to impose such import restrictions for the time being as will permit her the opportunity to re-establish domestic business conditions on a normal basis. The import restrictions being imposed by Great Britain are for such purposes, and are not to be regarded as of a permanent nature. The following articles, which are of importance to the metal industry, have been prohibited for import by March 1st by the British Government; Manufactures of aluminum, aluminum powder, all kinds of baths of metal cartridges, all kinds and parts thereof, electrotypes; machine tools and machinery driven by power and suitable for use in cutting, stamping or working metal, including lathes, grinding machines, milling machines, boring and turning mills, drilling machines, power presses, planers, punching and shearing machines, shapers, forging machines, screw machines, cutting-off machines, chucking machines, gear-cutting machines, boring machines, centering machines, slotting machines; machinery driven by power and suitable for use in cutting, working or operating on wood, including sawing machines of all descriptions, general joiners, mortise, tenon, boring machines, lathes and rounding machines, box and cask making machines, all machines accessory thereto; scraping and sandpapering machines, wheelwright machinery, firewood making and bundling machinery, wool, wool fiber and pulp machinery, saw sharpening and setting machines, saw stretchers and brazing apparatus, plated and gilt wares.

PRINTED MATTER

Brass Goods—The F. L. Klenck Company, San Francisco, Cal., has sent out the February issue of their interesting series of card calendars in connection with the extensive line of brass goods manufactured by them.

Calendars for 1919.—P. Pryibil Machine Co., 512-524 West 41st street, New York, manufacturers of spinning lathes, tools, chucks and accessories, are sending out calendars for 1919 and 1920, printed on celluloid. These will be sent upon request to concerns desiring them.

Metal Cleaners—The virtues of Natrolin, which is claimed to be one of the most economical cleaning compounds for any use in connection with metals, are adequately described in the little folder just issued by the W. A. Fuller Company, manufacturers of industrial chemicals, Pittsburgh, Pa.

Air Separators—The Stratton Air Separator is described and illustrated fully in a small eight page pamphlet issued by the Griscom-Russell Company, 90 West street, New York. These separators are used to remove water from compressed air before the air is used for its ultimate purpose.

Zinc—The New Jersey Zinc Company, whose new building at 160 Front Street, New York City, was described in the January issue of THE METAL INDUSTRY, has announced the installation of its general offices through the medium of a handsome booklet which carries upon its cover a half-tone of the new building.

Inventors' Manual—A new book has just been published by the Norman W. Henley Publishing Company with the above title. The book contains 144 pages including an index and is devoted to matter designed as a guide to inventors in perfecting their inventions, taking out their patents and disposing of them. It contains a quarter of a century's experience of a successful inventor together with notes based upon the experience of many other inventors.

Tanks—All varieties of tanks—square, round and rectangular—made of oak, cyprus, cedar and yellow pine, is the subject matter of a new catalog issued by the Atlantic Tank and Barrel Corporation, successors to J. Schwartzwalder & Son, Inc., Hoboken, N. J. This company manufactures tanks for every conceivable purpose and for every industry wherever it may be located.

Magnetic Tester—Herman A. Holz, New York, has issued two bulletins giving descriptions of the magnetic testing apparatus manufactured and sold by him. The first of these bulletins is concerned with the Magnet-Meter which is an apparatus for the precise, convenient and rapid investigation of the magnetic qualities of permanent magnets. The second bulletin describes the Fahy Permeameters of the compensated and simplex types.

Silver—The Silver Situation in 1918 is very convincingly handled by John F. Harman, chairman of the Board of Handy and Harman, Inc., silver manufacturers, New York, in a twenty-two page pamphlet just issued. Mr. Harman covers the ground relating to the silver situation in a very thorough manner and he comes to the conclusion that "it seems probable from these premises that current prices will be maintained for some time to come and conditions become operative that might even lead to higher figures."

Electro-Plating Supplies—Frederic B. Stevens, Detroit, Mich., manufacturer and dealer of foundry and electro-plating supplies, has issued the first number of volume two of the "T" series of his interesting little house organs. The current issue is entitled "T'Other and Which" and is just as replete with wit and humor as its predecessors—"This and That," "That and This" and "This, That and Then." The book also contains a number of descriptive advertisements of the Stevens products for founder and plater.

Brazing and Soldering—A little book by James F. Hobart has just been revised and enlarged. This is said to be the only book that shows the metal worker just how to handle any job of soldering and brazing that he may encounter. It tells what mixture to use and how to make a furnace if necessary. The sixth edition of this book of fifty pages has just been published. It is full of kinks and gives a large number of tested formulas of all kinds. The book is published by the Norman W. Henley Publishing Company of New York.

Foundry Supplies—A most comprehensive catalog containing four hundred pages has just been issued by the Buckeye Products Company, Cincinnati, Ohio. This catalog, which is known as No. 7, contains illustrations and descriptions of about everything that is necessary for the operation of the foundry. Among the materials that are represented are foundry facings, graphite crucibles, crude plumbago, moulding machines, crane ladles, crucible, annealing, core baking and mould drying ovens; sand riddles, flasks, sand blast machines, furnaces, etc.

Powdered Fuel—The Quigley Furnace Specialties Company, engineers and contractors, 26 Cortlandt Street, New York, has issued a very interesting folder giving illustrations of installations and descriptions of the Quigley Air Transport System, which is used for transporting and burning powdered fuel. This company makes a specialty of fuel selection and application, furnace design construction and operation, and furnace materials and appliances. One of their most prominent products is Hytempite, the high temperature furnace cement.

Finance—The Mechanics and Metals National Bank, of New York, recently issued a sixty-page pamphlet which is called "The World's War Debt." This booklet contains a record and analysis of the financial obligations left by the war in relation to the world at large. The foreword of the book announces that the need for statistical summary of the finances of the recent struggle was the sole incentive for carrying out the work and the readers will find in the book material that has been brought together for the purpose of information.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL STOCKS MARKET QUOTATIONS

New York, February 10, 1919.

	Par.	Bid.	Asked.
Aluminum Company of America	$100	$500	$600
American Brass	100	213	218
American Hardware Corp.	100	133	138
Bristol Brass	25	28	32
Interantional Silver, com.	100	20	—
International Silver, pfd.	100	82	87
New Jersey Zinc	100	255	260
Rome Brass & Copper	100	300	350
Scovill Manufacturing	100	340	370
Yale & Towne Mfg. Co.			

Corrected by J. K. Rice, Jr., & Co., 36 Wall street, New York.

METAL MARKET REVIEW

Written for The Metal Industry by W. T. Partridge.

COPPER.

February 10, 1919.

Notwithstanding general optimism as to future conditions in the copper industry, business during January was slow and dull, although radical price reductions were made from time to time in an effort to encourage buying on the part of consumers in this country. At the beginning of the month, quotations in the outside market were for prime Lake, 23.00c.; electrolytic, 21.50c.; casting copper, 19.50c. per pound. Gradually, in the absence of demand, electrolytic and casting prices declined, quotations by the middle of the month being 1.00c. per pound less. No important export orders were developed as had been expected and the decline continued including prices for prime Lake. Quotations at the end of the month showed a net recession of 3c. per pound to 20c. for prime Lake, 2½c. per pound to 18.75c. for electrolytic, and 2¼c. to 17.50c. for casting copper. The large producers made no change in their nominal asking price of 23c. per pound for Lake and electrolytic. At present copper is being offered by the producer at 18½ cents. Representatives of the Copper Export Association went abroad late in January to canvass the foreign situation.

TIN.

Because of complicated conditions in the tin market, there was even less activity during January than in December, the trade, generally being in an expectant attitude and believing that something would develop to relieve the restrictions placed upon it by the 72.50c. per pound Government price for Straits metal established December 4, with importations cut off except through the United States Steel Products Company, from whom it is now possible, however, to buy in 5-ton lots instead of 25-ton lots as was at first announced. Other varieties of pure tin during the month were obtainable first at 71.50c., but as the month progressed, there was a gradual decline to 68.75c., while 99 per cent. tin held at 68.75c. early in the year, on January 31 could be bought for 67c. per pound. Prices abroad in January declined until importations, if they had been allowed, could have been made at 54c. per pound.

LEAD.

Strenuous efforts were made in January to readjust the lead market to normal business conditions. Production was reported as having been reduced to 50 per cent. in 1918 operations because of the over supply on hand. In the absence of demand, prices were cut by the American Smelting & Refining Company from 5.70c. East St. Louis basis, 6.00c. New York, the quotation January 1, to 4.95c. East St. Louis, 5.25c. New York on January 31. The outside market followed each reduction made by the "Trust" with a further shading of prices, quotations showing a net recession of ¼c. per pound during the month. Lead ores throughout the month were unchanged at $60 per ton.

Arrivals at port of New York in December were 897 tons lead ores and 6,100 tons base bullion, the latter coming from Mexico. Exports during the same period were 4,569 tons according to New York Metal Exchange figures.

SPELTER.

The spelter market in January was further weakened by lack of demand and the continued increase in production and accumulation of stocks. Prices gradually declined on all positions, from 7.60c. East St. Louis, 8.00c. New York, January 2, for prime Western to 6.60c. East St. Louis, 6.95c. New York for prompt and February. March and April deliveries were held January 31 at 6.45c. East St. Louis, 6.80c. New York. The market was stagnant and it was claimed that prices had declined to below cost of production, the total recession for the month being 1.00c. per pound. Brass special and the higher grades of spelter, the latter, which were in constant demand during the war, were entirely neglected during January. High grade ore declined to $50 per ton, second grade to $40-42 with low grade held at $35 per ton.

ALUMINUM.

After a period of inactivity during early January, in the aluminum trade, considerable activity was developed following a drop in prices from the Government's fixed maximum base 33c. per pound in the open market to 32c. for carloads 98-99 per cent. virgin, 29c. for 98-99 per cent. remelted and 27c. for No. 12 remelted. The demand for aluminum in this country, except for very brief periods usually exceeds the supply of metal, but with the ban recently announced by Great Britain against importations of aluminum articles or metal, which soon becomes effective, there will be metal available for new uses. Importations into this country are still restricted but it is known that large stocks are held in France which will be sent over to compete in the market here as soon as the ban is lifted. In the last week, sales of spot and nearby as well as of future positions were made at further reductions and at the end of January, 98-99 per cent. virgin could be bought for 30-32c. per pound, remelted at 23 to 27c., while scrap in large quantities was sold at 22 to 23c. per pound.

ANTIMONY.

The antimony market in January, like all other metal markets, reflected the general inactivity in business pending readjustment to new conditions following cessation of the war. While exact figures of stocks held in this country have not yet become available it is known that such holdings are very large. Fortunately, these stocks are in the hands of importers who are abundantly able to carry them until demand for the metal has revived. Prices at the end of January were firm at 7.50c., duty paid, for prompt and February wholesale delivery, this being a net recession of ⅛c. per pound from the opening at 7.62½c. on January 2. The total decline, however, was from 7.75c., the advanced quotation a few days before the middle of the month, which had resulted from a few sales being made about that time.

SILVER.

Notwithstanding some agitation during January for the removal of Government price restrictions on silver, no change had yet been made at the end of the month. Despite the fact that this maximum price, $1.01⅛, is the highest monthly average paid in many years, producers controlling more than 60 per cent. of the annual world output, assert that the existing demand for silver justifies a price of $1.25 per ounce.

QUICKSILVER.

As was generally expected, the quicksilver market in January registered a further decline in prices, the total recession being $17 to $98 per flask by the end of the month. Even lower prices are expected if demand is not revived in the near future.

PLATINUM.

Stocks of platinum held by the Government were released gradually in small quantities during January to consumers having immediate need of the metal. In pursuing this policy no precipitate decline in prices of the metal is anticipated. Sales at the end of January were reported at $98-100 per ounce for pure, this being a recession of $5 to $7 from the maximum base fixed by the Government at $105 per ounce.

OLD METALS.

Progress in adjustment to new conditions in old metals resulted in still further declines in prices during January, in sympathy with similar progress in the major metals. Business was practically at a standstill until late in the month when a slight improvement was noted in special cases. Aluminum was fairly active and advanced from 15c. early in the month to 18c. for old cast, toward the close. Light brass was off ½c. to 7.00c. and the coppers were down to 14.50-15.00c. for strictly crucible, 11.50-12.00c. for light copper. Old zinc scrap was up ¼c. to 5.00-5.25c., but otherwise the list was unchanged.

WATERBURY AVERAGE

Lake Copper Average for 1918, 24.75. 1919—January, 23.00.

Brass Mill Spelter. Average for 1918—9.858. 1919—January, 9.00.

JANUARY MOVEMENTS IN METALS

	Highest	Lowest	Average
COPPER:			
Lake	23.00	20.00	21.75
Electrolytic	21.50	18.75	20.006
Casting	19.50	17.75	18.483
TIN	*72.50	*72.50	*72.50
LEAD	6.00	5.25	5.798
SPELTER (brass special)	7.85	6.70	7.254
ANTIMONY	7.75	7.50	7.591
ALUMINUM	†33.10	†33.10	†33.10
QUICKSILVER (per flask)	$115.00	$100.00	$107.932
SILVER (cts. per oz.)	101⅛	101⅛	101⅛

*Government maximum price.

†Government maximum price for carload lots.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. page.

Metal Prices, February 10, 1919

NEW METALS

COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Electrolytic, carload lots	18½
Lake, carload lots	19½
Casting, carload lots	17¾
TIN—Duty Free.	
Straits of Malacca, carload lots..Government price	72½
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	5.25
SPELTER—Duty 15%.	
Brass Special .....nominal	6.75
Prime Western, carload lots	6.65
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	....
100-lb., f. o. b. factory	....
Ton lots, f. o. b. factory.....Government price.	33.20
ANTIMONY—Duty 10%.	
Cookson's, Hallet's or American.....Nominal	
Chinese, Japanese, Wah Chang WCC, brand spot..7.625	
NICKEL—Duty Ingot, 10%. Sheet, strip and wire, 20% ad valorem.	
Ingot	40c.
Shot	43c.
ELECTROLYTIC	45c.
MANGANESE METAL .....Nominal	
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$1.90
BISMUTH—Duty free	3.50
CADMIUM—Duty free .....nominal	1.50
CHROMIUM METAL—Duty free.....nominal	
COBALT—97% pure	3.00
QUICKSILVER—Duty 10% per flask of 75 pounds.....$	95.00
PLATINUM—Duty free, per ounce.....$98.00 to	100.00
SILVER—Government assay—Duty free, per ounce	1.01⅛
GOLD.—Duty free, per ounce	20.67